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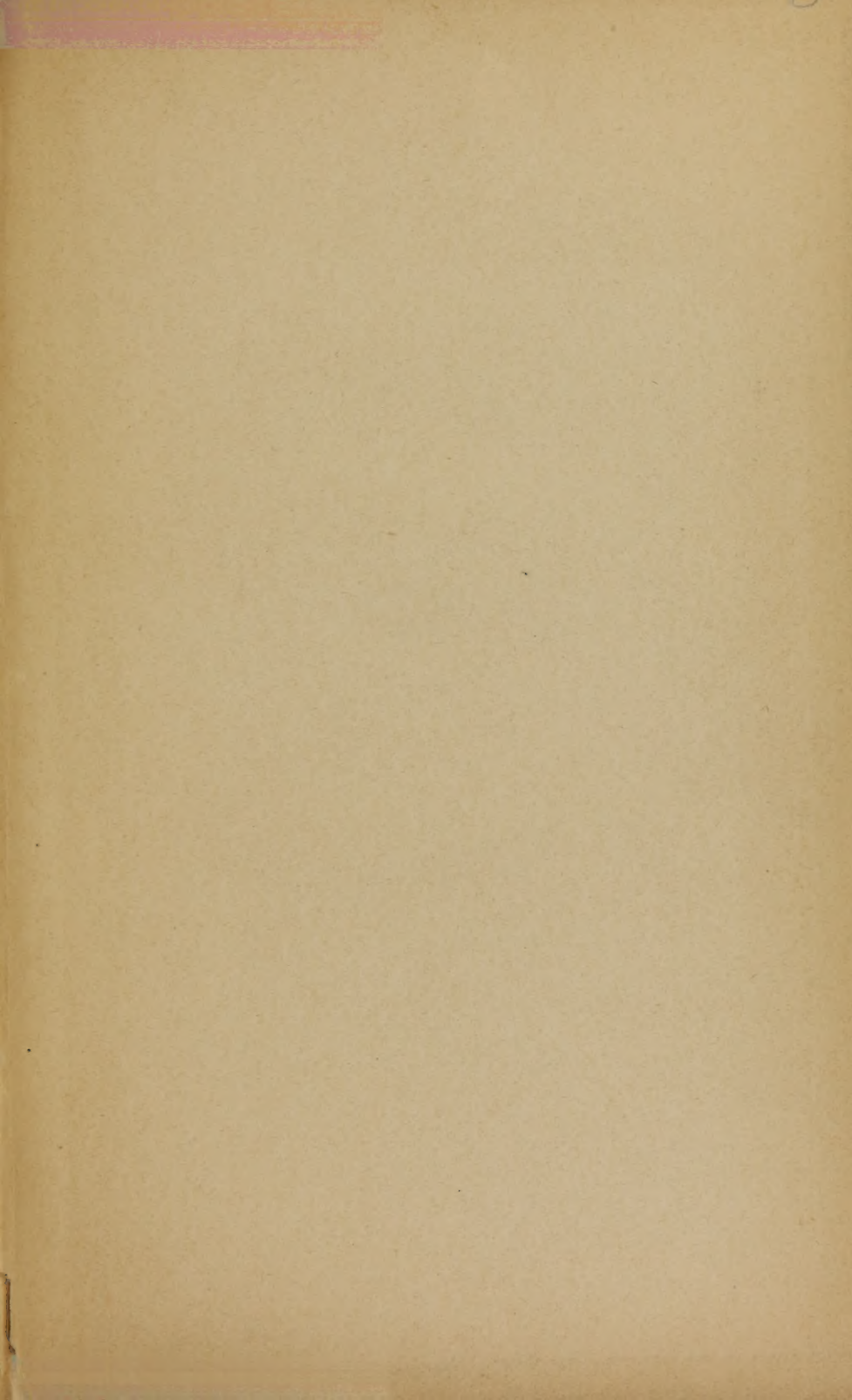
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THE ELEMENTS
OF
SURGICAL PATHOLOGY
WITH
THERAPEUTIC HINTS

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TO MY FRIEND,
SAMUEL CALVIN,

PROFESSOR OF GEOLOGY,
UNIVERSITY OF IOWA,

THE FOLLOWING PAGES ARE INSCRIBED AND
DEDICATED.

AS SOME FAINT TESTIMONY OF APPRECIATION OF HIS EMINENT
STANDING AMONG BIOLOGISTS,

AND HIS MANY ACTS OF KINDNESS TO THE AUTHOR.

THE DOCTRINES TAUGHT WILL NOT MEET HIS FULL APPROVAL, BUT THE
FAIR-MINDEDNESS WHICH SO EMINENTLY DISTINGUISHES HIM,

WILL PROMPT HIM TO GIVE A PATIENT HEARING TO ONE

WHO DIFFERS FROM HIM, AND HIS GOOD-NATURE,

EQUALLY AS CHARACTERISTIC, WILL

PERMIT HIM TO ACCEPT THIS SLIGHT TOKEN OF ESTEEM

FROM HIS FRIEND,

THE AUTHOR.

PREFACE

THE following pages have been written to present, or to attempt to do so—something systematic in the study of the etiology of morbid action, from the standpoint of one not in harmony with very much of the teaching of the day. The current literature, as well as the text-books, assume so much, and are apparently so oblivious of the fact that there is wide diversity of opinion on this question, that something seems necessary from the other side on this subject. The profession, may be divided into two classes, the *clinicians*, and the *experimentalists*. The students of the laboratory may certainly boast the largest following, but it is the worker in the clinic-room that must fix the seal of approval on the product of the former. None will be disposed to question that the technique of the laboratory cannot be carried out in the operating theatre; hence ideal results are impossible. But we find much inharmony among the bacteriologists. For instance, one among very many—Dr. ALEXANDER WILDER, in the June (1895) number of the *Metaphysical Magazine*, has this to say on what he calls the “Microbian Craze:”—

“The notion that the atmosphere is forever swarming with germs of bacteria and other microbial products, ready to rush into wounds, into the lungs of every breathing thing, into our water and kneading troughs like the frogs of Egypt, and to enter the pores and through the stoppers of glass bottles, is purely a guess, without a solitary fact to sustain it, except such as are found in the interpretation wherein the guess is

taken as established fact. It is a plausible theory, but unproved. We are brought, therefore, to the conclusion inevitably: The germ theory is an assumption of causes, of the existence of which we have no evidence, to account for effects which they by no means explain."

It is impossible to present any adequate argument against the teaching of the laboratories, as far as it has to do with the practice of surgery—in a short essay, certainly not with any approach to thoroughness. The attempt is here made, therefore, to cover the ground somewhat systematically, commencing with an account of processes that are on the border line between physiology and pathology, and studying the development of morbid action as something due to perverted function, assuming that conditions leading to inflammation are common initiatives to all pathological states. For this reason it will be necessary, for the reader to go through the book consecutively, one chapter being intimately related to that which precedes it. The introduction of "therapeutic hints" may be considered slightly incongruous in a work of this pretension, but the student may find them useful. In the preparation of the material much is due to the advice and assistance of friends and associates, to none more than to Dr. SAMUEL N. WATSON, of this city. My thanks are also due, and most gratefully rendered, to my student, Miss GRACE S. STAUFFER, for much clerical labor, and invaluable assistance in correcting the proof sheets.

J. G. G.

IOWA CITY, IOWA,
August 15th, 1895.

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ELEMENTS OF SURGICAL PATHOLOGY

INTRODUCTION

OF books on surgery there is no lack. All departments of surgical science and art seem to have received attention, and the student can experience little or no difficulty in finding what he needs, with, perhaps, a single exception. Operative and emergency surgery is particularly well treated, in almost numberless books; special topics are the subject for many volumes of more or less pretensions; the medical periodicals are full of discussions of etiology, preventive medicine and therapeutics. The lack, if it be one, is in a systematic treatment of surgical pathology, pure and simple, from the standpoint of what may be called the *vitalist* as opposed to the *bacteriologist*. A very large number of practitioners, and students, as well are far from ready to accept the popular teaching with reference to etiology and the essential nature of morbid action, and yet are without any systematic treatment of the subject from their point of view. As one who has always been conservative in this matter, and formed opinions upon a basis of actual experience, and not at all contemptible in extent—it has seemed to be, in a measure, an obligation to attempt something in the way of a systematic presentation of the question at issue, more particularly as the results of practice, based upon these views, have been so eminently satisfactory. The theory upon which this book is written, therefore, is that morbid action is essen-

tially a question of the organism, rather than of its environment. To properly introduce a study of pathology on these lines, a preliminary discussion must be had of the nature of morbid action.

An organism, we were formerly taught, was something provided with organs. As some organisms had many organs, and others were themselves a single organ, the definition was inadequate. It might be said that an organic body differs from an inorganic one, in that it has a principle of life; or, in other words, does not grow by accretion and move by external forces, but appropriates, elaborates and assimilates food for nutrition and moves by forces, other than chemical, operating within itself. It also has the property of reproduction. These properties call for more or less complexity of structure, and we find great varieties, commencing with the simple unicellular bodies, terminating in man, the most complex of all. If we analyze an organ, or an organism, we find quickly that there are various units to be considered. The anatomist finds his unit, perhaps, in the organs or grosser divisions of the whole; possibly in the tissues of which the various organs are composed. The histologist, commencing where the anatomist ends, finds his unit in the cell, the material unit, we may say, out of which the tissue is formed. The physiologist will need a unit beyond this, farther back in the order of development; he will need a molecule or its representative. Now a molecule in physics and chemistry is something, with reference to the mass of which it forms a part, that represents the ultimate physical division of a substance—one molecule of any given substance, is the same as any other molecule from the same substance. Such a conception cannot be realized in the organic world, the ultimate division of any one part being utterly unlike that of any other part. More than that, the physiological analogue to the molecule is not a simple body or structure; it is a complex one, complex beyond our comprehension. It may, roughly speaking, be considered the ultimate division of matter, in which the properties of the matter still exist; the last point reached in subdivision before resolution into the atoms

of the chemist. Such cannot be a molecule, in the accepted use of that term. FOSTER suggests the word "somacule" as standing, to the physiologist, for the molecule of the chemist. Beyond this unit, is still another, which the chemist needs, the *atom*, out of the union of a number of which the molecule is made. Thus while all organisms, even the simplest, are complex, complexity increases with differentiation. We may state here, in passing, that vulnerability increases with complexity, just as with machinery. The simplest organisms carry out their life's work and reach their ultimate destiny, with far less interruption than those of higher and more complex organization.

The organism being completed, no matter what its grade as to complexity, it is unstable. This instability is essential, and well understood. Work is accomplished at the expense of material. The molecules, yes, the atoms of the tissues, are constantly wearing out or forming new combinations and their places filled by new ones. This constant loss, the so-called "molecular death," is not uniform, either with reference to periods of life, or day by day. In a general way, repair of waste exceeds loss during the growing years of the organism; say from birth to full maturity, or the age of thirty or perhaps forty; the relation becomes somewhat disturbed towards the end of this period, or the last ten or fifteen years. For a longer or shorter time there is an equilibrium, or if loss exceeds repair it is not appreciable. After this, loss rapidly exceeds repair and soon the mere molecular death becomes a dissolution of the organism, or somatic death. During all these periods, again, the relation of waste and repair depends upon bodily conditions and environment; extreme changes of temperature, bodily exertion, the occurrence of disease or accident, all increase, for the time being, the waste, which is to be made good by periods of rest, under normal conditions.

As far as we know, the life history of simple organisms is exceedingly uneventful; they seem to be free from any morbid conditions, and the emergencies are not many, under ordinary conditions, apart from pursuit from higher organisms in

their search for food. As the organism becomes more complex, conditions favorable to morbid action must increase, so that the highest organizations, it would sometimes seem, are, in the very nature of things, impossible of maintaining for any length of time absolutely orderly function. The relation of one function to another is so intimate, and at the same time so complicated, that every moment of existence is one of peril. Absolute, typical, and physiological function is necessarily not to be looked for. If health stands as the representative of proportional waste and repair, which are the results of the orderly performance of all function, suitable nutrition, in kind and quantity, and proper sanitary conditions, none of the higher organisms can be in a state of absolute health, even for short periods of time together. The mere occurrence of any disturbance in the various associated functions of the body, must inevitably cause some more or less notable crisis in the organism. The causes for these disturbances are manifold, and act with varying degrees of intensity. Some of them may be very energetic, and yet little permanent loss and slight temporary disturbance ensue. Others are so insidious, or inconsequential, apparently, that they may even elude detection. In fact it may be asserted, the more insignificant the cause, apparently, the more profound the impression. It will serve a useful purpose, by way of illustration, to classify all forms of morbid action under two heads; the traumatic and the idiopathic. The former would attribute all causation to violence, of any degree, whereby structure is at once altered or destroyed. The latter would be the occurrence of morbid action from causes different in character, in many cases not to be detected, and in which the consequences are slowly developed. Now it is well known, that the idiopathic group of morbid processes are much more serious, in every way, than the traumatic. In fact, it is often the case the immediate consequences of traumatism may pass away entirely and only after a long interval will secondary morbid manifestations appear. This may be due to a latent morbid action starting into activity under the stimulus of the traumatism; or it may

be due to some disorderly attempt at repair, or some accidental occurrence during the process. But whatever the case may be in these traumatic conditions, is not this a notable feature in *all* morbid action: *the pathological changes commence on the atomic plane*. All disease or morbid action is representative of some exhibition of energy; it is not in any sense material. The tissue changes are the result or consequences of some disorderly action, something immaterial and undemonstrable.

We find all forms of morbid action to be, as to design or result, either, constructive, destructive, or trophic. New tissue is produced in one case, as in carcinoma, or syphilis. In another case tissue is torn down, or in some way is broken up, as in ulceration, or gangrene. In still other cases we find abnormalities of growth, as in atrophy or hypertrophy. No matter in which one of these classes any given case may be placed, always we find the initial lesion, the very commencement of the pathological peculiarity, will be in the domain of the microscopist. The construction, destruction, or abnormality of growth does not attack the whole organism, or even a whole organ or part at once; it commences in the microscopical elements of the part, or even back of that, in the molecular or atomic constituents.

We know how important the defecation of an organism is to its well-being: some have gone so far as to say it is equally so to its nutrition. The failure in the elimination of urine is productive of consequences known to all. The excretion of the body through the skin, lungs, intestines, kidneys and other important glands, is an enormous amount. The failure of any one must cause speedy death, if there is no compensation. All this elimination is secured by processes that even the microscopist and chemist cannot detect; all of it has to do with the somacules and atoms. It is surely not hard to credit, indeed it seems a patent fact—that all morbid action represents some molecular or atomic loss, or disturbance; some question of nutrition or excretion. It is not unreasonable to suppose that with the commencement of morbid action on this elementary

plane, the causes, essential causes, are of similar character. This, however, has to do with a later discussion. At this place we may assume that morbid action is representative of some disturbance of nutrition (or excretion), commences on the atomic plane, extends to the "somacular," thence to the cellular and so to the tissues, the organs, the organism. Nothing gross, as to magnitude, nor intense, as to energy is needed. It is not even necessary that it should be material, mere mental impressions, or if you please, psychic disturbance, may derange function, and tissue-change is then easily induced. Thus it may be said, although the topic will come up again later, that while the actual form of morbid action is determined by forces acting and originating entirely within the body (intrinsic), the incitement to such action may be and, in all probability, usually is, in some force coming from without.

However the morbid action may be set up and no matter what its character, duration, or intensity, there is always a tissue-change, a structural loss more or less irreparable. An organ or part once diseased, a defect remains that is permanent, although reproduction, after a prolonged interval, may render its site and nature indiscoverable. It will be shown later, when surgical repair is reached, that lost tissue is never replaced in kind; the new tissue is only a bond of union, structurally and functionally unlike that which was lost. There is a difference between traumatic and pathological loss that must be borne in mind. In traumatism there is no antecedent morbid action, functional or organic. The injury at once destroys tissues, and repair is soon set up as a physiological process, a sort of exaggeration of normal repair. In pathological conditions, on the other hand, there has been a longer or shorter period of destruction going on, and when this is arrested, either by art or spontaneously, repair must be halting and imperfect, from the impairment of all function by the preceding morbid action.

Now this replacement of lost tissue by tissue of lower grade, and unfitted for the former function, destroys the organ, more or less, or, if any essential organs are involved, the organism itself perishes.

Thus a morbid action in the kidney, that destroys the proper tissue by displacement with a new tissue, must necessarily destroy the organ, and the organism thereby be deprived of an essential factor to its well-being. The consequences are practically the same in destructive or degenerative morbid action. A heart which has become fatty, has lost its ability to carry on its function, just as surely as though its muscular elements had been displaced by scirrhus, or lost by suppuration, or gangrene.

It must be apparent, and no argument can possibly be required to enforce it—that a morbid action once set up, the *vis medicatrix naturæ* about which so much was formerly said, can do little to arrest, and as little to repair. The new tissue exists under the same conditions that the normal tissue did. The destroyed tissue, can only be imperfectly replaced. The degenerated tissue cannot be made over; it must remain unchanged and thus cripple the part, or undergo destruction. The sole function of the *vis medicatrix* must necessarily be to protect the organism from the assaults of morbid action, to oppose its extension when once operative, or to repair, as far as possible, such damage as may be done. The repair, we shall see in a later chapter, is never reproduction; it is never more than a compromise. The local and structural defect must operate as a functional weakness, and future morbid action is more readily set up. The lesion leaves a scar that remains during life.

It must be remembered, that “nature” does not reproduce lost structures; it simply fills the gap with a bond of union. It may be truly said that “nature” is a bad physician; it never cured a morbid action without doing as much damage, or more, than the disease did. It will remove foreign bodies by a destructive suppuration and overcome any impediment to function, or attempt to do so, by destroying the organ at fault. Illustrations are too numerous to need mention. The function of the *vis medicatrix* being to protect the organism from morbid influences, when disease comes “nature” has exhausted its resources and the existence of disease is a confession of defeat.

One other fact as to classification. Morbid action is either *specific* or *non-specific*. The terms are often used very loosely, and fail, frequently, to convey a definite meaning. Among medical students I have always found it quite difficult to disabuse their minds of a pre-conception, that specific is another term for syphilis. It is true that syphilis is eminently specific, indeed may well stand as a type of the whole class, but of course it is very far from being the only representative of such forms of disease. There are certain characters that attach to specificity; all of them must be present in any given case. It will be better perhaps to put these characteristics in the following form:

1. There must be an unvarying natural history; one case must be just like another, only differing in degree, or virulency.

2. There must be a regular progression of phenomena.
Thus:

A period of incubation;
A period of efflorescence;
A period of decline.

3. There must be a series of sequelæ, as distinguished from concomitants, or complications.

4. The products of the morbid action must be contagious; they must be capable of conveying the infection to others.

5. The contagious principle must be hetero-inoculable, that is, innocuous to the individual furnishing them.

6. There must be future immunity, prophylaxis.

Should any of this sextette be wanting, the case cannot be considered typically specific.

A *non-specific* disease is the opposite of all this; some one or more of the elements must be lacking. While it is impossible to state that any one of the six is of higher rank or importance than another, possibly the future immunity and hetero-inoculability of the products might stand as the characters that render a specific disease something radically different from those in which these features are lacking. It is somewhat singular, when we consider that the microbial theory of causa-

tion would make it peculiarly applicable to specific diseases, yet it is in the two notably specific forms, viz.: small-pox and syphilis, that no such causation has been demonstrated to the satisfaction of the profession.

So much for my conception of the nature of morbid action. It must surely be admitted that the facts are quite as stated, however much discussion there may be about the cause for the condition. Any theory of therapeutics that is not based on some tenable theory of morbid action must, in the nature of things, lack something of a scientific foundation. When a theory of morbid action gives support to a theory of therapeutics, and the practical application gives the expected and desired results, surely there is good ground for the belief that theory has become fact.

Before taking up the more particular study of Surgical Pathology, there are two preliminary questions that should be answered, if possible. The first of these is: what is Surgery? On careless or superficial examination, the question would seem to be one easily answered, but such is far from being the case. One class of practitioners connect the word with its ancient significance, and restrict its use to conditions that may or do call for purely mechanical or instrumental treatment. If this were true, it would not be long ere surgery would include only accidents, deformities, or defects possible of alleviation by art. Another class would make it include all morbid conditions that are characterized by objective phenomena. This would give such a wide range, in these days of diagnostic "instruments of precision," that the physician, as distinct from the surgeon, would find himself left with a very limited and narrow field, and one that would grow even smaller year by year. Neither of these definitions, therefore, can be considered satisfactory, albeit each of them possesses a part of the truth. The strict application of the word, in accordance with modern practice, would put under the head of surgical affections all morbid action, resulting in radical tissue-change, whether degenerative or constructive (chiefly the latter), occurring on the surface of the body, or accessible inner parts, together

with deformities, acquired or inherited, and accidents of all kinds. Thus while lithiasis, when confined to the kidney, is a purely medical affair, stone in the bladder, on the contrary, is as eminently surgical. The nucleus from the vesical stone may be derived from the kidney, however, and if, at its first formation, its fate and destiny could be foreseen, the renal lithiasis would be surgical and not medical. Inasmuch as a large proportion of vesical calculi do originate in deeper portions of the urinary tract, urinary lithiasis is commonly classed among the properly surgical affections. It would seem, therefore, that a categorical answer to the query cannot be made, at least in the present state of the science; the classification of morbid conditions, into medical or surgical, is purely arbitrary and cannot be otherwise; custom and an indefinite standard have made a classification that is quite generally accepted, and with that we must at present be content. This refers, of course, to conditions of the body in which no question of mechanical or instrumental treatment has admission; in others there is no debate.

This second question is: What is Pathology? Fortunately this can be more readily and definitely answered, nevertheless there would seem to be a few who entertain views and opinions very wide of the truth. The etymology of the word sufficiently defines the ground to be covered, that is "a discourse on suffering" or disease. Thus we find that pathology is literally the natural history of morbid action, including objectivity; etiology, remote and immediate; character of the lesion, constructive or destructive; as well as furnishing data to trace to their source all purely subjective phenomena, estimate their value, and determine their significance. Therapeutics has, as already noted, the closest relationship to pathology, if one would escape becoming a mere routinist, and experimentalist; and the prognosis is something unattainable, if the study of the fundamental principles of morbid action is ignored. Even morbid anatomy, which some consider the whole of pathology, has a significance to the scientist, which seems to be entirely unsuspected by a respectable minority in our branch of the therapeutic art.

The fundamental ideas, in the discussion of the various exhibitions of morbid action that will claim attention in the following pages, will be that bodily health is dependent upon normality of function; that function is directly related to structural integrity. That modifications of function are the result of morbid influences not necessarily material in character. Finally, that sufficient explanation of all the phenomena is to be found in accepted facts of physiology and chemistry.

I.—DIAGNOSIS

Diagnosis is a term signifying the formation of a theory of a given case, not so much with reference to giving it a name as to comprehend its natural history. A diagnosis is reached in many ways; sometimes prolonged and frequently repeated examinations will be necessary; at other times a conclusion can be reached very quickly, often at a mere glance. Inasmuch as a correct theory of a case has relation to prognosis as well as therapeutics, none can afford to slight or neglect it, albeit there are a few who affect to treat it as of little moment. Wherever examination of any extent is needed to make out a diagnosis, the order of procedure must be by one of two methods, *analysis*, otherwise called "exclusion"—or *synthesis*, which might be called "inclusion." Unquestionably the former is to be preferred, but inasmuch as cases *may* arise in which a choice of methods is not presented, a word or two, if only for illustration, may be needed.

Analytical Diagnosis is a process of differentiation, in which the features of a given case that are common to many forms of morbid action are selected, and the exclusion of those not present. As a case in point, a tumor on the head is presented. It may be a sebaceous cyst, a fungus of the cranium, fungus of the dura-mater, enostosis, or hernia cerebri. It is noticed that there are no signs of brain lesion, either past or present, no history of traumatism; a slow growth and absence of pain. At once hernia cerebri and fungus of the dura-mater are excluded. The tumor is soft and movable, and exostosis is stricken out. It is symmetrical in shape, movable at the base, and hairless; also the growth has been slow, and

there are probably more than one. This excludes fungus of the cranium, and leaves sebaceous cyst alone. In the great majority of cases this would be a natural process, one that reaches the information desired in the quickest manner, and by the most direct route. To some extent it represents the manner in which the remedy is selected by the majority of Homœopaths.

Synthetical Diagnosis, or the method of "inclusion," is occasionally practiced, though I fancy it is nearly always a question of necessity rather than of choice. In this case the mind of the examiner is a blank; he forms no conception of the case in advance, and is compelled to construct one as the narrative or examination proceeds. In some forms of the neuroses, in hysteria, in feigned diseases, or possibly where the patient is unconscious or insane, the synthetic method may be the only practicable one. There are a small class of cases in which the subjectivity constitutes the whole of the case, but they are very few in number; it is the exceptional case when there is no objectivity, if only posture, facial expression, or the like.

However the diagnosis is reached, it is based upon three factors: *Anamnesis* (history), near or remote; *Etiology* (causation), essential and accidental; and *Semeiology* (symptoms), all the accompanying phenomena.

ANAMNESIS.

In one sense the history of a case is of the first importance; in another it is of minor value, in fact may be misleading. Truthfully told, it is, very often, our only guide to a correct diagnosis. There are so many causes for error, however, some of them involuntary, and others designed, that it is a safe rule to give no value to statements that are not borne out by the semeiology, particularly the objectivity. From mercenary motives, to extort charity; or to excite sympathy, from egotism; from fear of punishment, or loss of esteem; from shame, when moral delinquencies are in question; or for various other reasons, patients are not seldom untruthful. Some most

remarkable instances have been met; cases in which truthfulness is necessary for the saving of life, patients have not only concealed dangerous symptoms, but even denied their existence. Women have been known to deny the existence of pregnancy, when at the very time the child has been born and still attached to the mother and violent hæmorrhage is endangering their existence. There are many cases in which deception is unintentional, as through ignorance, failure to understand questions, insanity, or some acute dementia. The patient may be unconscious, and the bystanders may not be able or willing to give any information. Thus there are very many conditions that often render a history of no value, or impossible to obtain, and other means are to be taken to secure the information. These difficulties are sufficiently embarrassing when immediate history is needed, as in acute affections, and accidental surgery; they become more serious, perhaps, in cases where remote history, as in chronic cases, is required, particularly as to ancestry.

Anamnesis includes several considerations, particularly in old chronic cases or some infantile affections. Thus *previous history* is at times something almost indispensable to a correct diagnosis, in some of the exanthemata, alopecia, bone diseases, glandular enlargements, or affections of the eye, where syphilis may be suspected. The initial lesion of syphilis is often so insignificant that it escapes detection and thus, unintentionally, an important fact is concealed; or some other motive may prompt a patient to deny such an occurrence, notwithstanding he knows the contrary. Even in accidents, fractures, dislocations and gun-shot or other wounds, the conditions under which the accident occurred, will often constitute very essential features. A fracture near a joint, or extending into one, often presents so many symptoms of dislocation, that an accurate diagnosis is well-nigh impossible. In such cases, knowledge of how the accident was received may often turn the scale in one or the other direction. In fact there are few surgical affections or conditions in which a truthful and circumstantia history is not of the first importance, for purposes of diagnosis

and yet the sources of error are so numerous that something additional and confirmatory must always be sought.

Another item in this connection, is *duration of the present condition*. In specific diseases, and some of those that are called "self-limiting," an obscure diagnosis may be cleared by learning how long a time has elapsed since the first symptoms appeared. This fact is of more value for purposes of prognosis, it is true, but is not without value in diagnosis as well. As an illustration, take a dislocation of the shoulder. The time that has elapsed determines the condition of the parts involved, whether original parts are obliterated or not; the condition of muscles, nerves, or blood vessels as to shortening or the establishment of new relations,—in a word, whether the dislocation remains recent, or has become ancient.

Course and Development, from the commencement to the time of examination, is of similar value. The regular progression of successive phenomena, as occurs in venereal specific affections; the sudden rise in temperature, and associated symptoms on the fourth or fifth day after injury or operation, as indicative of septic affection; the general formation of adhesions and glandular enlargements, occurring in malignant growths, are all cases in point of the value of accurate history in this respect. A truthful and minute history in all the above particulars would alone be amply sufficient to form a diagnosis; but as such is never, or rarely, to be had, we must go farther in our examination, to fill gaps in the record, and to confirm what has been presented.

ETIOLOGY

The causes of disease or injury must necessarily play a most important part in diagnosis, taking equal rank and liable to the same limitations as history. In nearly all cases the first step is to separate alleged from actual causation. In a large number of cases, perhaps a majority in surgical practice, morbid conditions are referred to some accident or injury. The usual course of events in traumatism is for the injured tissues to speedily return to something near their former state.

Occasionally important structures are divided, such as muscles or nerves, and a loss of function ensues; this loss is immediate and permanent, but later changes frequently occur, resulting in some secondary or remote loss. Where the traumatism is not sufficiently severe to produce extensive loss of structure, the consequences are always evanescent. Later consequences in the nature of morbid action are rare. When such a connection *is* made out, in the majority of cases there can be no question, the morbid action was roused into activity by the traumatism, which latter has, therefore, only an accidental relation to the former. Morbid action can only arise from traumatism, pure and simple, when the accident so modifies nutrition that trophic or degenerative processes are set up. As a stimulus to arouse a latent morbid action into activity, traumatism unquestionably plays a very important part. It is equally true that the degree of injury is usually very slight; anything that will induce local irritation. We must look elsewhere, then, for the actual causes for morbid action, and may classify them under two heads, the *material* and the *immaterial*.

Material Causative factors, including mechanical injuries of all kinds, unquestionably play a most important part. While not a natural arrangement, chemical agencies must also be included under this head. For some years past the microbian origin of morbid action has been an article of faith to a large majority of the medical profession, and is still so to some extent, but the original teaching has been so modified that it looks as though the whole question was on the eve of retirement to the limbo of medical curiosities. It is not proposed to argue the question at any length, but something must be said, if for no other reason, to justify the teaching to follow later, so radically different from that popular to-day.

The objections to the doctrine of bacterial infection are many. One of the most potent, it seems to me, is the *insufficiency* of the philosophy. To make the statements or arguments of the bacteriologists authoritative, two things are necessary: *First*, an unfailing occurrence of a definite form of morbid action when a particular organism is present. *Sec-*

and, the organism must always be present when the disease is encountered. To this might well be added another, viz., the presence of organisms must antedate the symptoms of disease. All of these conditions are wanting at times; frequently one of them is lacking, and it would seem a failure in any one of these particulars must be fatal to the theory, and the whole system of philosophy based thereon. It is admitted that the last, or the appearance of microbes before the outbreak of disease, is difficult to establish, or the reverse, as medical attention is rarely directed to a patient before he becomes sick. We do know, if we may believe the evidence of our senses, that there are many cases in which no organisms are found where the teaching of the day renders it essential that they should be. A notable illustration is found in suppuration, where there are certain forms that seem to be sterile, and in others the streptococcus is found in abundance. There are other diseases, like small-pox and syphilis, the most virulent of the specific contagia, where either no supposed pathogenic organisms have been found at all, or the evidence is so conflicting that it is a matter of grave doubt.

In the *American Medico-Surgical Bulletin* for May, 1895, the following language is used in an editorial article on "Antitoxine-Therapy," which is significant in this connection:

"Studying the subject from the one side or the other alone is sure to lead the investigator into error. If the bacteriological side only is considered, the results are bound to be misleading. For it is a well-known fact that quite a large percentage of cases is known to have the Klebs-Loeffler bacilli in the mouth and fauces and still never have diphtheria, nor cause the disease in other subjects, so far as can be directly determined. If all these cases are to be classed as diphtheria and subjected to the antitoxine treatment in the absence of well-marked clinical evidence of the disease, which appears to be the plan pursued in many instances, the mortality will naturally fall, and a very fine showing can be made for the antitoxine-therapy.

"On the other hand, it is equally well known that the most

competent clinicians and bacteriologists admit that in fully 25 per cent. of the cases of true diphtheria the Klebs-Loeffler bacillus cannot be found, and that of these a large percentage of the cases dies. If this group in which the bacilli cannot be found is not subjected to the antitoxine treatment, and is excluded from the mortality statistics of diphtheria, another large source of error in the making up of the statistics is apparent. In this particular class the death rate may run high, even with the aid of the antitoxine treatment. Until the mortality of this group is added to the bacterial class, and the cases which have simply the Klebs-Loeffler bacilli in the throat, but are without symptoms, have been eliminated from the statistics, no reliable statistics can be developed as to the true value of the antitoxine treatment in reducing the mortality in diphtheria."

Of course the occasional failure of all the conditions must necessarily destroy the philosophy, but even were it not so there are other reasons that should go to show its insufficiency. The first of these seems to be that the specific forms of the so-called pathogenetic organisms are not sufficient in variety to furnish such marked variety in the forms of morbid action. What is known as *pleo-morphism*, in which bacterial forms go through a cycle of changes, is an apparently fatal blow to the theory that morphology and physical properties are satisfactory guides in determining the species. Thus the editor of FELLOWS' Monographs (Part XI, 1st Sect., p. 45), says: "As to the question of pleomorphism do the various micro-organisms which exhibit different morphological and physiological attributes, belong to different species? or do these germs pass through curious adaptive stages, dependent on their development and environment? PASTEUR himself, as one can see in his work on 'Studies on Fermentation,' is most careful not to dogmatize on this matter, but rather to take up the 'not proven' attitude; others, like Koch, have pronounced decidedly *against* the pleomorphism. But certainly the weight of evidence is increasing daily and appears in many instances to have taken the form of demonstration, that, if we want the clearest

proof of an influence of nutritive media and of external circumstances in altering old, and developing new species, we have it in micro-bacteria; and that *micrococcus*, *bacterium*, *leptothrix*, and *spirillum*, are but different phases of development of '*micrococcus*,' which is the primitive form." Now if species and form go for nothing in determining properties or function, to say nothing of the usefulness of "bacteriology" for diagnostic purposes, all relationship to causation must cease. It is impossible to conceive of the same cause at one time furnishing cholera, and another anthrax, and still another suppuration. The experiments of PETENKOFFER and EHRLICH, with the *comma bacillus*, have given a shock to the doctrine which must go far to hasten its extinction, or at least to cause an entire revolution. That many forms of morbid action are accompanied by various species of micro-organisms, none can question. Admitting, for argument only, that they are always present, and when present definite morbid phenomena occur, it is jumping at a conclusion to claim them as *causes*. Is there not equally good evidence to prove a *compensating* function? May they not be considered *curative* rather than *causative*? Again, if morbid action is to be explained by bacterial contact, all such forms must be contagious, or infectious, or specific, or all three. There is one way in which bacterial infection may, and probably does produce morbid action; that is by their dead bodies setting up septicæmia. Many writers, notably in the current volume of the *International Journal of Surgery* (1893), have strenuously insisted that the use of antiseptic dressings have *produced* septic infection, and probably in this way, *viz*, destroying the micro-organisms in the wound. Of course such a practice may devitalize the tissues, and thus furnish septic material. Thus J. MCFADDEN GASTON, M. D., of Atlanta, Ga., in a paper read before the Medical Association of Georgia, April 19th, 1893 (*International Journal of Surgery*, Vol. VI., p. 129), says: "The modes adopted for testing the introduction of microbes into the system, have not afforded any conclusive evidence as to the etiological factor in the development of morbid products. But the observation of bacteriologists has

gone very far towards establishing the existence of special forms of bacilli in different types of disease. Whether these various modifications of the bacterial order enter as a causative element; or simply as a concomitant of the several disorders with which they are associated, has not been satisfactorily elucidated. A grave point for consideration in connection with the development of bacteria in the physical organization, is whether they are hurtful in the living condition or after losing their vitality and acting as ptomaines in the organs. If the analogy of the growth and the decay of hydatids in the tissues can hold in the case of bacteria, it may be inferred that the chief harm results from their death and decomposition."

Furthermore, the bacterial theory is *unnecessary*, in so far as there is an ample, logical and, it seems to me, self-evident explanation of the occurrence of disease without their aid. Disease is nothing but a perversion of function, disturbance of nutrition; in other words it is what is expressed in the term "morbid action." Of course this statement goes for nothing as an argument, for because a thing can be done one way is no good reason for not doing it in another. Neither can it be overlooked, that the morbid action may as well receive its initiation from bacterial infection, as any other external agency. But the fact remains that the beginnings of bacteriology were based upon the assumption that the causes for morbid action were inexplicable and that this new philosophy furnished knowledge that had hitherto been unattainable. On these grounds, I base the objection of unsatisfactoriness, nay more, that the difficulty, if there was one, has only been added to. It is an explanation that fails to explain. It is unsatisfactory, also, on the ground that infection or contact is, by their own confession, far from being followed invariably by the characteristic morbid action. If the anthrax germ is *the* cause for anthrax, no one should escape who is brought within its sphere of influence. But multitudes do escape, possibly the majority. Why? They tell us there must be a receptivity, a suitable soil, a predisposition, a derangement of function. No one disputes this, but if the commencement or predisposition to illness

must exist before the germ contact occurs, it is a bold man who affirms the germ was the cause for all the later mischief.

Again, I find the claims of the bacteriologists *unscientific*. If want of accuracy in foundation principles, and insufficiency of the theory to account for the phenomena is granted, lack in scientific requirements is a necessary consequence. The presence of micro-organisms in many cases of disease is granted, but their relationship thereto is not unquestioned. There are equally good reasons to esteem them conservators, or consequences as active and specific causative agents. But there is one circumstance that weighs heavily in the scale against the bacteriologist, *viz.*, that nothing of therapeutic value has come out of the discussion. At first we were to destroy them in the wound, and apply dressings that would prevent later access. Then we were to destroy them in the atmosphere, in addition to the wound treatment. Then it was found the germicide agents did about as much harm, or more, to the tissues and the organism, as the germs. Then that the operator's health suffered from the germicides; and now, once in a while, we meet with men who have the courage of their convictions, and tell us to avoid bringing any chemicals in contact with a wound, and even to avoid plain and sterilized water as lowering the vitality and resistance of tissues. Who would dare, five years ago, or even two, to use such language as that of Dr. GASTON (*l. c.*), who says: "At this time the medical profession is undergoing a most interesting transition from the extreme views which have been held by some in regard to the employment of germicides in surgical practice. There was a time within the past decade when it was deemed to be scientific and progressive to use antiseptic measures of the most energetic kind in all operations whether there was a septic element to combat or not. But thanks to the mature investigation of the effects of germicides upon normal structures, by bacteriologists of the highest order of qualifications for this class of work, it has been demonstrated that these so-called antiseptic agents are capable of setting up septic processes in healthy tissues. The tables are now

turned, and instead of a surgeon being compromised by eliminating germicides from his surgical procedures in ordinary cases, and confining his irrigation of recent wounds to simple sterilized water, it is he who departs from this course by the employment of solutions impregnated with toxic agents, who is held responsible for the consequences of their absorption." Those who practice what they now call "aseptic" surgery are very contradictory in their statements. At one time they tell us the germs find entrance through the wound, and when sepsis or suppuration occurs we can usually find some error in the dressings to account for it. At another time, however, we are told the microbes enter the organism by other channels, and find their way to the injured territory through the blood. Undoubtedly we find many kinds of micro-organisms in the tissues, and possibly in the blood, in cases where there were no wounds to give them entrance. How is exclusion to be practiced, when all the efforts are expended on the dressing of the *wound*, and such accessible routes left open as the mouth, nose, and other outlets? In short, after a patient, long-lasting, and serious study of the question of bacterial infection, particularly as causative of disease, observation of the practice and results of those who adhere to it most strictly, and a very careful study of wound treatment in my own practice and of those who think with me, I am forced to the conclusion that the whole theory is a false one. One thing is absolutely certain, that years of experimentation have conclusively demonstrated, that practice in accordance with the teachings of bacteriology has given either negative or disastrous results.

Immaterial Causation, by which is to be understood the appearance of disease without visible connection with external morbid agencies, is represented in a large class of cases. If the theory adopted as to causation in general is true, anything which would derange function, even for a very short time, or in a minor degree, is capable of setting up morbid action; *provided* there is a predisposition thereto, or the irritant is supplied sufficiently often. Thus, it is found that not only pure

neuroses, but conditions characterized by the most extensive tissue-change, may result from mental disturbances alone. Fright, and possibly joy, under certain conditions of the body, may even cause death. It is supposed by many that despondent states of the mind may be an essential predisponent to carcinoma. However the facts may be with reference to the grosser lesions, there can be no doubt that what may be called purely *psychical* conditions may be the cause for profound organic disturbance, and with other conditions favorable organic lesions are possible.

Now, as to this part of our subject it may be said, and with the authority of dogma, that no matter what the character of the morbid action may be, there must be, in all cases, an organic lesion. This lesion may be macroscopic or microscopic, gross or minute, but the statement must be accepted that while perfection of structure *generally* insures correspondingly perfect function, there can be no loss or disturbance of function without an antecedent structural loss.

Finally, as to *Etiology*, it serves a useful and practical purpose to classify all causative factors under two heads, the *predisposing* and the *exciting*.

Predisposing causes are those conditions that render one person more liable to morbid action or injury than another. From the fact that such conditions are of a character to retard or prejudice repair or recovery, they are also spoken of as *maintaining*. Also, from a consideration of these two circumstances, such factors must be of the utmost importance; they are spoken of as *essential*. There can be no question that this class of causes is of the utmost importance, not only for purposes of diagnosis, but for therapeutics as well. Necessarily, they are causes of very great variety, including some that are constant, and others that are occasional, but all having a strictly personal character. Thus Age, Sex, Occupation, Social conditions, Race, Habits, Previous diseases, and Family history are all to be considered.

Age, by alterations in the bones, both as to form and composition, is an important factor in differentiating fracture from

dislocation. The alterations in function, due to old age; the slowness of repair, the predisposition to certain morbid conditions, as carcinoma, will often serve to clear up a doubtful diagnosis. For instance, a tumor may have certain characters that render it difficult to determine whether it be sarcoma or carcinoma, but if it be on a young person the presumption is strong in favor of sarcoma.

Sex is, of course, important in the diagnosis of abdominal tumors. Apart from this, the exigencies of child-birth, the monthly functional disturbances often accompanying menstruation, and lactation, render women as a class more liable to morbid action than men.

Occupation is little less important than age or sex, not only with liability to injury but various diseases. As a rule men are more exposed to accident than women, and also, from their active business life are predisposed to derangements of the stomach and bowels. Certain callings are notably dangerous to health: as illustrations, the necrosis of match-makers, from the action of phosphorus; the affections of the lungs among grinders in steel-works; of rheumatism, among millwrights, or those who work in water, may be noted.

Social Condition, with particular reference to worldly condition, is another important item. The idle wealthy, and the over-worked poor, alike furnish susceptibility to particular forms of disease. The clothing, lodging, and food must exercise a very important influence in the liability to disease, and such considerations are often closely related to social condition. In the same connection the question "married or single" will be an important factor, particularly as to presumption of pregnancy.

Race has more or less to do with liability or susceptibility to morbid action, partly from environment, and partly from habits of body perpetuated from generation to generation until they assume permanent characters. Goitre, among the Alpine Swiss; aneurysm among the Irish and North of Europe people; urinary calculus in certain localities, are instances in point. There are certain forms of disease, or abnormalities, such as

hernia, that seem to be unknown among certain races, but it is probable, in this case at least, that it is more a question of habit. A very important consideration, under this head, but unfortunately one that is not well understood—is tolerance of mutilation. The German seems to be the least tolerant, and the Chinese the most so. No attempt has been made to account for this remarkable difference, at least nothing conclusive has been established. The fact remains, however, and is one of much practical interest.

Habits naturally exercise a most potent influence on predisposition. Addiction to alcohol, sexual excesses, or over-use of any organ or function, will frequently result in morbid action. In this instance not only will the elicitation of this fact throw light on the diagnosis, but will point to important considerations in therapeutics. Habits and race must, to some extent, be considered together; many habits are peculiar, or more persistent among a race of people, and the consequences are of course soon recognized as peculiar to them, or very common among them.

Previous Diseases must be considered, more particularly to establish a fact of sequence. Thus a history of the initial lesion of syphilis would clear up a diagnosis in some eye diseases, or exanthemata, or bone conditions. Then rheumatism, as a case in point in another direction, might account for some heart lesion. In these cases prognosis is much more concerned than therapeutics, and yet treatment may sometimes be anticipating when sequelæ are recognized.

Family History has a certain value, though not as much as was at one time attached to it. Offspring certainly may inherit "weak tissues," or predisposition to disease, and again prophylaxis may be secured, or at all events attempted, if certain facts are known.

Exciting Causes are those that operate on all persons alike, the consequences being the same under all similar conditions, varying only in degree, which is determined by the predisposition of the individual, or variations in the intensity of the vulnerating force, or similar modification. Sometimes the terms

“determining” or “accidental” are used. The question must be considered from two points of view, with reference to traumatism, or a purely morbid state.

As to *traumatism*, the question is important in locating a lesion: as in stab-wounds, and gun-shot injuries of cavities. Also, at times, with reference to particular vessels or nerves. It is also useful in differentiating fractures and dislocations, a bending force oftener producing the former, and a twisting the latter. In many other ways it often becomes important to determine how and under what circumstances an injury was received. Even in cases where fracture is easily made out, it is of the utmost importance, very frequently, to know whether the force was applied directly or indirectly, the line of fracture and the associated injury, if any, being often determinable thereby. But all this simply relates to injuries and the state of the parts as resulting therefrom. When any distinct form of morbid action is present, other questions arise. For instance: A small lesion results in erysipelas, suppuration, ulceration, gangrene, or a tumor. Now what relation did the injury sustain to the latter phenomena? Surely not causative, in the proper sense, as there was nothing in the nature of the alleged cause to produce such consequences. They come either from causes operating within the organism (predisposing), or infection of some kind, coming from without, the injury simply furnishing a mode of entrance, in the one case, or arousing a latent morbid process in the other. In this sense all exciting causes must be *accidental*. They are only *determining* in the case of pure traumatism. Where morbid action follows, it can only come from a cause capable of inducing that particular form and no other. Erysipelas and ordinary suppuration are not one and the same thing, nor are they related to each other. So the terms “exciting,” “determining,” and “accidental,” are not, strictly speaking, convertible terms. They all belong to a common class, but are not identical.

Grouping all the exciting causes together, they may be classified as *traumatic*, exposure to *contagion*, or exposure to *morbid* influences.

Traumatism or the receipt of injury, can never be consid-

ered a cause for morbid action, and yet loss of blood, confinement, and shock will produce functional disturbance which may result in disease. A healthy body, as will be shown later—when injured, immediately sets about repair, by a sort of exaggeration of physiological processes. If they go wrong, are too energetic, or a secondary disturbing factor comes in, morbid action may result. Perhaps the commonest of these secondary factors is septic absorption, from the decomposition of devitalized tissues. Deformity, or loss of parts (functionally) from adhesions, division, and the like, are not to be considered “morbid.” With these limitations we may say, and say truthfully, that mere traumatism cannot originate morbid action. Disease may follow, but only from the operation of secondary forces, often that are made operative, it is true, by injury done.

Exposure to Contagion is something very different from the above, and opens up a field for discussion that is almost limitless. Of course, it is important to have some conception of the nature of contagion, but the testimony offered is so conflicting, and the actual knowledge, in the very nature of things, so meagre, that it will be long before anything definite is obtainable. That certain material is capable of setting up morbid action in the body, under suitable conditions, is evident. That this material, for the most part, is organic or a product of organic bodies, and in some instances is associated, in one way or another, with micro-organisms, is indisputable. This is true of all the specific diseases, the contagious and infectious particularly, and of many of the exanthema. Some of the most contagious and specific diseases, as already stated, are not as yet associated with bacteria, or similar organisms, and while that may be merely a question of technique, to be satisfied in the future, yet we are justified in assuming, in view of the long and patient researches that have as yet come to nothing, that if micro-organisms *are* essential factors, these conditions must stand as exceptions to the rule. But in some way these contagious elements have certain powers of inoculation, properties which, for the present, must be largely matters of speculation. In many cases the results of such

contact resemble very closely, if they are not identical with, septic infection. The microbes may be nothing more than media of contagion; or the decomposition they undergo may be the active agency; or they may—although there are grave doubts about it—be actually specific, or pathogenetic. However this may be, not to reopen a discussion closed in an earlier chapter.—one thing is evident: mere contact will not necessarily result in infection. The individual may be protected by previous inoculation; he may be invulnerable from ancestral inoculation; he may not be susceptible to morbid influences. As has been tersely stated (the reference has been lost), micro-organisms cannot infect a healthy body. We seem to know, from numberless experiments, that the leucocyte has the property of destroying hostile organisms, and from this property has been called “phagocyte.” Therefore, while exposure to contagion is one of the exciting causes of disease, yet the forms of morbid action so set up are few in number and there is still needed a predisposition to render the contact efficacious.

Exposure to Morbid Influences has a wider signification than the foregoing, including much that is far from being *contagion*. The topic, however, can be briefly treated, as the conditions are all general in character. They would include errors in diet, exposure to cold, deprivation from food, unusual fatigue, strong, sudden mental emotions, or any similar or analogous emergency that first disturbs function, more or less extensively, and then, from some predisposition, sets up morbid action. It will be shown later that frequent irritation of an organ, which is but another term for over use of a function, will finally result in some morbid action, and hence, while the frequent repetition of an unphysiological activity will fall under the head of a predisposing cause (*habit*), yet it is at the same time in the nature of an exciting one.

SEMEIOLOGY.

Semeiology, the study of symptoms, is a feature in diagnosis very different from the other factors discussed. By one

class of practitioners very little attention is paid to symptoms, at least as to minute differences, and they affect to treat their study with disdain. Some of them ridicule the Homœopath because, as they say, "he treats symptoms, and ignores the disease." Possibly such an objector may mean something more than the language seems to imply, but it would be interesting to know by what *other* means he acquires a knowledge of disease. Symptoms are the expression of a morbid action, the only evidence we have of its existence. Differences in similar symptoms point to differences in the morbid process, and a diagnosis, to say nothing of treatment, is almost impossible without giving them due consideration. Another class do not attach too *much* importance to semeiology, because that would be impossible, but fail in discrimination. They take a partial view of the subject, and neglect to weigh the value of indications, or even to verify mere subjectivity. Now, all symptoms must fall in one of two classes: *essential*, or *subordinate*. The former are all such symptoms as may be considered central, of paramount value as indices of morbid action. To detect them is the aim of the diagnostician, and to act on the information furnished the object of the therapist. Hence a symptom must be explained; we must seek to know what *causes* it, as all symptoms are caused by an organic lesion. Now, by "lesion" is not to be understood a visible loss of structure or continuity; it is any change in the structural characters of a tissue or part, transient or permanent. A hyperæmia is a lesion in itself, regardless of its duration or later consequences. Thus, an essential symptom is that one, or group, which is directly related to the lesion, and is therefore of value to the diagnostician as indicating the seat and character of the lesion, and to the therapist as furnishing most important data for correct treatment. The pathologist is also interested, as the natural history of the whole process is thus made clear, and prognosis rendered possible.

Subordinate symptoms are of two kinds: one class are those which naturally would follow the particular lesion under observation, either by extension of the morbid process, or by

secondary influences on related functions. The other class are those that are determined by idiosyncrasies of the individual, and are of minor value as a rule. The value of semeiology, as an aid to diagnosis at least, is proportionate to the ability to distinguish the central symptom, and separate the essential subordinate manifestations from the non-essential.

All symptoms are to be classified in still another manner: *subjective* and *objective*. This classification is a fundamental one, and must precede the former.

Subjective symptoms are those which the patient alone can appreciate; alterations in feeling and perception that have no expression capable of detection, as a rule. Among the more important of these is pain, which has no physical expression necessarily. In most instances, of course, pain is associated with heat, redness, swelling, or something apparent to the observer, and yet there are many cases in which there is no such expression whatever, nothing but the patient's statement in evidence. Other symptoms, such as heat, may be both subjective and objective; it is felt by the patient, and can be detected by the thermometer. Purely subjective phenomena are of little value taken alone, particularly if contradicted by objectivity. As a rule, they can be ignored if there is no confirmatory evidence, and at all times must be guardedly accepted. The vagaries of hysteria, the ingenuity of malingerers, or the lack of intelligent narration by the honest sufferer, combine to throw a cloud of suspicion around any history of suffering or disturbed function that is not vouched for by reliable objectivity.

Objective symptoms, on the other hand, are most reliable data, depending upon the skill, ability, and experience of the observer. They are all such expressions of morbid action as can be detected by the physician without the aid of the patient, bringing to his aid all the "instruments of precision," as the microscope, ophthalmoscope, various speculæ, chemical analysis, the thermometer, sphygmograph, and the like. They constitute indications of the utmost value and importance, out-ranking, possibly, all other elements of diagnosis. Certainly

there are sources of error even here, but they are all, or nearly so, personal to the examiner.

As indications of the class of symptoms coming under this head, may be mentioned, information derived from palpation, percussion, study of excretions, physiognomy, posture, alterations in sensation, diminished or preternatural mobility; also changes in form, color, volume, transparency, consistency, relations, pulsations, sound or smell. Originally this group of symptoms included only those that could be seen, felt, heard, or smelled by the unaided senses; but the increase in number of diagnostic instruments, and their greater delicacy, have wonderfully enlarged the catalogue.

By all such means as have been indicated, must the diagnosis in obscure cases be made out. As a matter of course experience will greatly shorten the process, but the method is practically the same at all times. While neither one of the three elements, anamnesis, etiology, and semeiology—may possibly be placed above the other in value, in a large number of cases, objective semeiology will unquestionably be of prime importance, particularly when the analytical or exclusion method is pursued.

II.—PROGNOSIS

PROGNOSIS has an intimate relation to diagnosis, inasmuch as it is very closely dependent upon it; it is almost impossible, under many circumstances, to foretell the result of a case if the diagnosis is not clear. The "foretelling," the future history of a case is what is meant by prognosis; not only estimating the final outcome, as to death or recovery, but the course of the disease, its possible complications and sequelæ, as well as the condition, as to usefulness or function, of the parts chiefly concerned, or the whole organism. An accurate prognosis is therefore only to be reached through an accurate diagnosis, and with more or less experience with similar conditions.

The *natural* history of the particular form of morbid action, after its recognition, is first to be considered. Under the ordinary conditions of medical practice, this is always modified in many ways. Thus the previous bodily state is of prime importance. Almost any morbid condition must, as a matter of course, very seriously affect the prognosis; comparatively trivial ailments, occurring in one of enfeebled health, or who has recently passed through some serious accident, is often a portentous affair. This is also true as to accidents, or acute surgery. One who has some disease of the bones, will not recuperate in a typical manner after fracture; in fact there may be no repair at all. Syphilitics, or those who are victims of some profound dyscrasia, do not bear injuries well; wounds will be slow to heal, and repair of any kind will be greatly prejudiced.

Of almost, if not quite equal importance, the duration of the illness up to the time of commencement of treatment, or since

the injury had been received, must have a controlling influence on the prognosis. While this is true under all forms of disease, it is particularly so in cases of accident. Thus a fracture that has been neglected until consolidation has commenced, may be incapable of reduction, or at least it can only be had with difficulty, and then more or less incomplete. So in dislocations, if the cavity is filled up, wholly or in part, torn tissues united irregularly and with disturbed relations, the prognosis, as to recovery of usefulness and symmetry, must be poor.

The kind of treatment is of the utmost importance as modifying natural history and qualifying the prognosis. A very common occurrence is to meet cases of intestinal obstruction that have been treated with violent purgatives, having the effect to aggravate the condition—or ignorant attempts at the reduction of dislocated joints, converting a simple primary dislocation into a complicated secondary one. In homœopathic practice, while medicine is not given in massive or toxic doses, many a case is spoiled by a bad prescription. It is a common thing for those engaged in special practice, to find their first duty to be a correction, if possible, of some improper treatment.

Finally, the environment of the patient must receive due attention. Exposure to morbid influences must be looked into; the clothing of the patient; the sanitary condition of the dwelling, are all points of first importance.

Beside all these, circumstances that must modify the natural history, and thus obscure the diagnosis, there are others of almost equal importance, and yet to some extent included in the foregoing. Thus there are various complications that may be extrinsic or intrinsic as to origin. With good environment, with good treatment, and everything favorable to a successful conduct of a case, some passing indiscretion may set up a secondary morbid action, because of the general disturbance already existing. Gastralgia, enteritis, cystitis, or some other inflammatory affection may thus be superadded to some entirely unrelated condition, and even overshadow it entirely. Among the extrinsic complications, or rather causes for them, are sec-

ondary injuries, such as displacement of fragments, or changes in the position of the bone in dislocations, from careless or awkward moving of the part, or individual. In short the modifications and complications of diseases, or injuries, by multitudes of causes, many of them apparently trivial, are so many and so various, that there are times when a prognosis has to be very guardedly given, or even withheld altogether.

The problems to be solved in reaching an intelligent prognosis may be considered in something like the following order: As to continuance of life; as to preservation of function; as to the duration of the case; as to the future condition.

Continuance of Life.—Of course the first thing to be settled, on this point, is the part injured, in cases of accident, or the natural history of the particular morbid condition, as well as the kind of treatment, if any, already instituted, and other conditions as noted above. Certain injuries are mortal, in the nature of things, such as wounds of the medulla or upper part of the spinal cord; also wounds of the cardiac auricles; or extensive wounds of the liver. Others are mortal if not furnished immediate aid, such as wounds of the large blood-vessels, as the femoral or carotid, but which may not be so if steps are taken immediately to secure the vessels. As to morbid action, much depends upon the duration of the case, very frequently, which is but another term for the stage reached in the development. A notable instance in point is carcinoma, in which a cure may be expected if an operation is made in a very early stage, but is hopeless, as a rule, in later periods. Even in morbid conditions the anatomical question must be given precedence very often, as in carcinoma of some of the viscera, notably the pancreas, where the morbid action extends to the thoracic duct, which is a very common occurrence. One fact must be always borne in mind, however, the possibility of recovery in cases of accident that would seem to be intrinsically mortal, from some unusual exertion of the *vix medicatrix nature*, or some fortuitous circumstance altogether out of the ordinary course. Thus there are cases of spontaneous cure (painfully few in number) of cancer of the breast

or other glands, by atrophic changes altogether inexplicable, and even extrusion of the growth. In cases of accident, as formidable as deeply penetrating wounds of the brain, with considerable disorganization of its substance, recovery has occasionally been very prompt. In gun-shot, or stab-wounds of the heart, there are instances of remarkable endurance, or even recovery with no sequelæ, or none that were notable. Spontaneous arrest of hæmorrhage from large vessels; consolidations of enormous aneurysmal tumors, and other formidable conditions, have occurred, infrequently, it is true, but sufficiently often to illustrate the possibility. Thus it can be seen that while there are certain morbid conditions that almost inevitably lead to death, and some forms of injury that, from a consideration of the parts injured and the character of the injury, would seem to be mortal, yet recovery is possible if not probable, and such knowledge should lead one to be guarded in prognosis as to continuance of life, unless the indications are unmistakable.

Preservation of Function.—Under this head we find pretty much the same considerations as in the foregoing. The continuance of function is at all times proportionate to the amount or extent of injury done, and this can only be determined by the diagnosis, and a knowledge of the manner in which repair occurs. It is without doubt true that a lesion of any magnitude is never perfectly repaired; and yet it is equally true that after the reparative structure is completed,—that is, after all signs of organization have ceased,—there is a slowly-moving process of what might be called assimilation going on for the rest of the life of the organism, whereby in time the *appearances* of injury are gradually lost. But this is *only* apparent. Take, for instance, a muscle that has been completely divided. It is evident that as long as the divided parts are kept asunder the action of the muscle is lost; the *function* of the muscle, as far as contractility is concerned, is not lost, at least in all cases—but there is not the mechanical relationship between the origin and insertion that formerly existed. Contraction occurs in both directions from the point of division. Now, this gap

is not filled by muscular fibres, but scar tissue, and the proximal portion of the muscle exerts its influence on that, in place of the original point of insertion. Possibly, if this should continue, the function of the part might not be impaired; the effect would simply be that of unduly lengthening a tendon. But the scar tissue is inelastic, and is soon drawn out so that muscular contraction exerts no influence; the distal part of the muscle loses contractility, and undergoing atrophy, likewise loses all muscular characters. So again, in this case, adhesions may form to the bone, or other near parts, which would preserve the proximal portion of the muscle, but the adhesions may modify or cripple other functions, or at all events materially change the former action of the part. For instance, if the *biceps cubiti* were divided in the lower half, and adhesions formed to the humerus, the action of the muscle would be very different than when the original insertion into the radius was maintained. In the case of nerve lesions similar changes occur, possibly the results being more serious. Thus the proximal portion would soon, at least in favorable cases, furnish neural elements that might in time convert the scar tissue into some sort of nervous tissue; but long before this was accomplished, the distal portion would be converted into a mere fibrous cord, by atrophic processes. The losses of tissue from morbid action are similarly repaired, and followed, of course, by similar impairment of function, but the destruction is not as *deep*, as a rule, where life is not lost, and loss of function is thereby less noticeable.

Prognosis as to preservation of function must consequently depend upon our knowledge of the kind and extent of injury done to the tissue, the manner in which the lesion will be repaired, and the changed relation of the parts.

Duration of the Disease.—It is not at all times easy to determine this element in prognosis. In the case of the so-called “self-limiting” diseases there are so many disturbing influences that have the effect to modify the natural history that even here the prognosis must often be guarded. The conjunction “if” is a factor of prime importance. *If* so-and-so does

not occur, the duration may be foretold with some degree of certainty. The chief difficulty, however, is in the case of diseases that are *not* self-limited. Here the prognosis is to be governed by the intensity of the process, the recuperative ability of the patient, and the rapidity of its course, facts which may have a different meaning to different observers, equally well qualified. Again we find that diagnosis must claim first rank; the actual conditions must be recognized, and then the knowledge or experience of the observer must determine the question of duration. As statistical publications increase, there will naturally be more and more certainty in prognosis, but the conclusion in any given case must be in accordance with the law of averages.

Future Condition.—In some cases we are promised immunity from renewed infection, and yet there are exceptions to the rule. In other cases there will be more or less functional loss, as a rule, and yet accidental occurrences may ameliorate or aggravate. In other cases there are certain sequelæ to be expected; and yet racial peculiarities, inherited characters, the occurrence of secondary complications, or something unusual in the way of treatment may altogether pervert them, or if they do occur, there may be some unusual symptoms, some variations from the standard as to order of appearance or other character, that the diagnosis itself may be brought into question.

As to prognosis in general, therefore, it will be readily seen that nothing can be done without a correct diagnosis, and a careful study of causation and semeiology. To this must be added personal experience. When all the prerequisites are duly furnished, there are even then elements of uncertainty that must, in the nature of things, stand in the way of anything approaching certainty. It is far easier to give a bad prognosis than a good one. It is often the part of wisdom to avoid positiveness; have something reserved.

III.—THERAPEUTICS

STRICTLY speaking, “therapeutics” relates to all and every agency used in treating the sick, whether for cure or simple palliation; whether medicinal or instrumental. By common usage, however, the term is now-a-days restricted to the application of remedies; at least it is a very common practice. In a treatise on pathology, pure and simple, therapeutics would find no place; but in the present instance there is a necessity for some brief consideration of the topic.

Of course the function of the physician is first and foremost to cure his patient, and this, too, in the speediest, safest, and pleasantest manner. Unhappily, there are cases, all too numerous, where a cure seems impossible, although the list of such incurable maladies is becoming shorter year by year. Even where a cure is possible, there are many occasions where there is an amount of pain and suffering that can only be slowly alleviated, or some product of the morbid action that may retard full recovery, and some additional measures must be resorted to, notwithstanding their successful application may only have a very secondary influence in reaching the desired results. For these reasons, as well as others that might readily be given, therapeutics must be approached from many sides, even if the term is used in the common restricted meaning. This fact leads to a more or less rational classification of the subject, something like the following:

Palliative Therapeutics has reference to temporary relief, and may not lead directly to cure; in fact, as often practiced, it may retard or even forbid, cure. The use of opiates or anæsthetics would fall under this head. and is very commonly

productive of great injury. Yet there are cases where the best prescriber stands powerless in the presence of acute suffering, and in his ignorance and helplessness is fully justified in resorting to such unscientific, valueless (for curative purposes), or possibly hurtful measures. Such a contingency, I believe, is found in recurrent carcinoma, and similar conditions confessedly incurable, and for which rational palliation has not yet been discovered. Palliation, in this sense, is to be sparingly and guardedly practiced, yet there are many times when no one would be justified in withholding the poor comfort such a practice will afford. But there is another kind of palliation, one that *is* rational, and, in some sense, will have a curative influence, or at least materially aid other measures that are purely curative in design. Prominent among these, there will be noted *position*, in fractures, and other forms of trauma; heat or cold, in inflammatory affections, and many others.

Adjuvant Therapeutics may be palliative, but the controlling idea is something that will aid other and more legitimate kinds of treatment. Among the more common of these may be noticed poultices, in abscess; enemata, in constipation; position, in the approximation of wounds, and relaxation of muscular contraction, in fractures; diet, in gastric derangements; and improvements in sanitation, in epidemic or endemic outbreaks. Rational adjuvant treatment, based, of course, on scientific premises, is a matter of the utmost importance. All classes of practitioners, but particularly the surgeon—find it something indispensable. Routinism, as is always the case, often works positive injury; care must be had to employ such agencies on clear indications.

Medicinal Treatment is, as a matter of course, the essential element in any case. It is true that there are few, if any, morbid conditions that are unaffected by the proper remedy. I am firmly of the opinion that all diseases are curable, and *only* by prescription on homœopathic indications. Failure is due only to personal or general want of knowledge. The list of curable diseases is constantly being enlarged, and it is only a

matter of honest, systematic effort, on the part of the whole body of the profession when the "incurable" list will be completely wiped out. It is irrational to suppose that any condition of the body brought about by disturbed function, cannot be overcome by agents capable of restoring the lost equilibrium. The morbid influences are quite as immaterial as the agents that are opposed to them. There are many influences, however, that operate to retard the full realization of our hopes; the most potent, apparently, is the constant attempt to discover a material *materies morbi*, the search for which has a sort of fascination for students in science. Works on practice, or theory, more properly discuss this question; it needs only passing notice at this time. Yet while the indicated remedy is the essential element in the treatment of any case, the practitioner is withholding very much from his patient when he ignores proper palliation and adjuvants when needed. A point to be noticed is, that while the most satisfactory and typical form of administering the remedy is, as we say "internally," that is by the mouth—yet there are circumstances where this will be difficult or even impossible. For instance, in dementia, coma or syncope, tetanus, atresia or stenosis of the pharynx, it might be impossible to give the remedy in the usual way. We may resort to subcutaneous injection, olfaction, or direct application. The two former are preferable to the latter, as the remedy is taken up pretty much as though it were given by the mouth. The topical use of drugs is objectionable from every point of view. As a rule they are applied to raw-surfaces, which are excreting. To enable the drug to be taken up the action must be reversed, that is, it must become absorbing, and thus the conditions become favorable for septic infection. Another objection is, that the reparative elements, in wounds particularly, are injured, by dilution and otherwise, and repair is very materially retarded. This will be discussed later. Circumstances do arise, however, in which we seem to be compelled to resort to topical treatment, but I have never found the action of the remedy to be as good or prompt as when given in the orthodox manner.

Mechanical Treatment is both adjuvant and palliative, in a sense, but often is the essential element in many surgical affections. This is particularly the case in fractures, dislocations, deformities, such as talipes, and others. In such cases, however, there is no question of morbid action; it is traumatism, malformation, or arrested development, and the conditions to be fulfilled are primarily of a purely mechanical character. In many of these cases remedies have a certain sphere and influence, but, which is somewhat unusual, their relationship is purely secondary. That is, no remedy can reduce a fracture, nor secure retention after reduction; neither is a remedy absolutely essential to consolidation, as the process is a physiological one, and in nine hundred and ninety-nine cases out of a thousand the consolidation surely comes without any treatment whatever. Occasionally, however, repair may be hastened by the action of the proper remedy, or if there is any defect it may be corrected. Mechanical therapeutics, therefore, is purely and solely of surgical interest.

Instrumental Treatment includes all kinds of operations, as well as the use of diagnostic instruments of various kinds. The subject is too vast to discuss to a conclusion at this time, but something must be said of the sphere of operative surgery in connection with what may be called homœopathic therapeutics.

There are at least two classes of practitioners in our ranks whose ideas of the scope of operative surgery cause much embarrassment; one give it too great prominence, and the other depreciates it. The former, whatever they may be as *physicians*, are very poor representatives of homœopathy, as a rule. The latter, whatever may be their deficiencies in broad medical scholarship, are good homœopaths, using the term in its narrowest and most sectarian meaning. Neither of them advance the cause of either homœopathy or surgery, but rather retard it. If the whole profession were compelled to attach themselves to one or the other party, great damage would result to both interests. Fortunately, however, there is a much larger party, at once conservative and progressive, notwith-

standing the apparent contradiction, and it is to them, and through their efforts that we are to look for substantial gain to both surgery and homœopathy. This peculiar state of things places the surgical specialist at a singular disadvantage. Cases come to him for an operation. The patient has been led to believe the necessity exists, and the physician has conceived similar ideas, indeed is responsible for the patient's belief. Now the surgeon, if he is a homœopath as well, may, and often does see something better than an operation, but is not permitted to carry out his own ideas, as neither the patient nor physician will be satisfied with anything less than they have agreed upon. The surgeon will find himself accused of timidity, or ignorance if he dares decline the operation. This state of things stands as an obstacle to the development of homœopathy in connection with surgery. The ability to correctly determine whether an operation is imperative, or is to be preferred to other means of treatment, is only to be secured by long study and experience. Those not in surgical practice have no right to assume judicial functions. Those who would deny any place for surgery in morbid processes, are often ignorant of the causes for disease, and are arguing on purely theoretical grounds, too often fanciful theories with no foundation in fact—and have no conception of what true surgery is. Those who have put it first in the therapeutic catalogue, are too often equally ignorant of the nature of morbid action, and more frequently with very hazy ideas of homœopathic therapeutics. The true relation of surgery to morbid action cannot be dogmatically stated; at one time the circumstances of the case in hand will determine its position; in other cases there may be some generalization permitted. The whole matter is one of experience, not *personal*, but of the profession as a whole. For instance, a patient has a tumor. Can medicine cure tumors? Unquestionably. Can medicine cure this particular case? Who can tell! The surgical specialist knows that many apparently innocent tumors become rapidly malignant. The only evidence we have of the incurability of a particular tumor is the fact that it becomes rapidly worse, and when the

conviction is forced upon one that the remedies will *not* cure, too often the surgeon sees that *his* art is also of no utility; the patient has passed the stage where surgery can offer anything. If a tumor was removed when in the innocent stage, there would be a reasonable hope for a cure. At least nothing has been lost but the tumor itself. The whole question may be roughly stated as follows: The patient that dies from an unnecessary operation, who might have lived without it, is no greater sacrifice to medical incompetency and ignorance than one who dies from the want of an operation that has been withheld.

To sum up the whole question of therapeutics, it may be safely stated that there are very few cases, that are surgical in character, that call for any single species of therapeutics. In traumatism, *arnica*, *aconite*, *rhus*, or some other remedy, is often needed, in the absence of any existing indications, as a precautionary measure, or to anticipate conditions that experience teaches may arise if it is not given. The practice of surgery cannot be looked upon as a mere mechanic art. The practitioner needs, for daily use, a good knowledge of therapeutics, which alone will lead him astray. He must be a good diagnostician, with all therein implied, and even with all this at command, the state of knowledge to-day is such that he is frequently prevented from attaining anything like his ideal.

IV.—SEMI-PATHOLOGICAL STATES

THERE are certain conditions, in a sense physiological, that occupy the border line between physiology and pathology. Many words are used in medicine to-day, from long habit, that mean something very different from what they did originally. Thus we find these semi-morbid conditions distinguished by terms that are quite indefinite as used, and which may mean, and often are forced to do so, processes that are purely pathological. The conditions are such as represent a simple exaltation of function, something that involves no tissue-change, and leaves no structural defect behind it. At one time such a condition will be purely physiological, as occurs in the gastric hyperæmia accompanying digestion. Again, from unusual energy, duration, or frequent repetition, the same condition occurs, and is enduring, when it at once takes on pathological characters. Still again, it will occur remote from the actual lesion, only distantly, and yet actually, related to it, when it is once more physiological, but at the same time has a pathological relationship. Furthermore, as all pathological conditions commence in an exaltation of some function, these semi-morbid phenomena demand attention, particularly on the part of the surgeon. The translation of a reparative hyperæmia into a destructive inflammation is readily produced.

IRRITATION.

Undoubtedly there are two kinds of irritation. All functional acts are a response to suitable stimulus or irritant. An unsuitable irritant may and will arouse functional activity, but with an entirely different result. The forces of life, we have

seen, have a double purpose, and are engaged in a double work. *First*, the maintenance of life and health, partly by opposing disturbing influences. *Second*, the repair of injury done by disease or accident. Disease must always be esteemed a confession of the defeat of the forces of life, either temporary or permanent, notwithstanding few, if any, escape being brought under morbid influences at some period of their existence. When the departure from health is temporary, and slight in degree, under favorable circumstances nature is ultimately triumphant; but the victory may be materially hastened by the aid of art. Such cases, however, leave room for a reasonable doubt whether anything has been contributed by the prescriber in bringing about the happy result. In the other case, when the condition may be considered permanent, in a sense, the lesion is such that the structural and functional integrity of the part is forever destroyed, as far as nature's efforts to cure alone are concerned, and if victory is secured at all it is at a fearful expense and with permanent loss. To repeat, disease is not to be considered an essential element of life; and in spite of apparent recovery, every attack that is associated with structural lesion leaves an indelible impress of its operation, and to a certain extent shortens the life of the sufferer in proportion to the disturbance of function.

The prophylactic function is operative just so long as perfect equilibrium in the forces of life is maintained; as a virtue carried to excess may become a fault, just so may a physiological function, being exaggerated, pass into a pathological state. Thus a transitory irritation of the eye may result in a simple and short-lived conjunctivitis; prolong the irritation, or repeat it frequently, and the transient hyperæmia becomes inflammation, with possibility of grave injury to the organ. In the one case we have a simple protest against the irritant; in the second a yielding to its influence, and a consequent loss of structure to repair. It has been said that "a perfectly healthy individual never knows that he has any organs," their functions being carried on in such a silent and orderly manner that no feeling of discomfort is ever produced. To know that one *has*

an organ, in this sense, is to know that "something ails it." A perfectly normal stomach, one that never suffers abuse, may on an occasion have an unusual amount of work forced upon it by some indiscretion or excess in eating, the task is performed, at some expenditure of force, and if not too frequently repeated, only a temporary inconvenience is experienced. The organ of sight may be overtaken until it becomes so sensitive that every effort is made to protect it from that light which before was grateful to it. In either event there is increased amount of blood in the part, and some of the ordinary symptoms of inflammation, but no structural change has taken place, no lesion is discernable, and the duration of life is not visibly shortened or imperilled, either in the part or the organism as a whole. The Latin word *irritare*, from which our word irritation is derived, signifies to "fret," to "pull," to "excite," and admirably expresses what may be defined as a temporary exaltation of function.

There is another condition in which from long continued debilitating influences, local or general, anæmia results. The same conditions of irritation of the starved parts now exists as when the state is hyperæmic. In either case there is a protest against insufficient nutrition, either as to quantity or quality. In the one case there is deficiency in the *amount*, and corresponding deterioration of the elements; in the other there is no lack of quantity, but the innutrition exists from a *post* perfection of the blood so often characteristic of hyperæmia. Whatever the condition may be, however, as to *supply* of blood, plus or minus, the peculiar characteristic of irritation is functional exaggeration without structural change.

The sensations of the patient, the subjectivity, does not represent pain, but unusual sensibility; a simple illustration is thus given by BILLROTH (*Surg. Path.* 53): "You now see my ocular conjunctiva of a pure bluish white, like that of any normal eye. Now I rub my eye till it weeps, and the conjunctiva becomes reddish; perhaps with the naked eye you may see some of the larger vessels—with a lens you will also see the finer vessels full of blood. After five minutes, at most, the

redness has entirely disappeared." Here has been no pain, no change in tissue, no *change* in function; a slight, very slight elevation in temperature, a momentary excess of blood in the part and the whole process passes away. When there is positive pain, and the function is slightly *perverted*, the condition ceases to be one of simple irritation and becomes some kind of pathological state.

It is the fashion to speak of irritable bladder, irritation of the spine, or irritation of the brain or heart, when an actual pathological condition is understood. It is true the anatomical characters are not always understood, but there is more than a simple exaltation of function; there is a permanent abnormality, perhaps due to causes operating at a distance. Thus it has long since been shown that irritation of a sympathetic ganglion will produce exalted action in the organs or tissues under its influence; a section of the nerve will produce cessation of action. Now in irritable heart, if we look for the cause in the heart, itself, we may find nothing, and thus conclude that it is true irritation. If we remember the teachings of experimental physiology, we will extend our investigations to the inferior cervical ganglia, and the roots of the *par vagus*, and often will find some lesion there that at once places the cardiac irritability in a pathological group. When the exalted functional action is intermittent, at least not constant, and no local or general lesion is discoverable, that might operate as a cause, the term is proper and eminently suggestive. The moment some structural change occurs, however, no matter how slight, so that some effort at repair is demanded, at that moment the condition becomes something more than a simple irritation; it is then pathological.

Looked upon from a purely pathological stand-point, the irritation that converts a physiological into a pathological activity, is of one of three characters. It may be normal in kind, but too frequently repeated; it may be of undue intensity; or it may be something specific, as arsenic, or some other chemical substance.

Therapeutics.—Conceiving irritation to be the commence-

ment of organic change, and knowing, experimentally, the sphere of action of *aconite*, viz., commencing in vaso-motor irritation, with suppression of excretion, followed by reactionary exaggeration—we find this remedy of the first importance. It requires early administration, however, in the beginning of the acute stage. Also, it should be noted, when irritation is due to morbid action at a distance, the treatment must ignore the secondary irritation entirely.

SYMPATHY.

Sympathy, otherwise “reflex pain,” is a condition closely allied to irritation. It refers to phenomena, not necessarily pain—felt at a point remote from the actual lesion. It is something of very common occurrence, and has excited much discussion; there is, even now, apparently, quite as much obscurity, as to the actual cause, as there was fifty years ago. Some writers have thought the phenomena were due to a continuity of structure; others that it was a question of contiguity; some refer it all to nerve supply; and still others esteem it to be dependent upon a similarity of structure or function, one or both. We are justified, I think, in concluding from a study of such evidence as is at hand, that in many cases, if not all—the four conditions are associated, or at least more than one will have a causal relation to any case.

Continuity of Structure is apparently explanatory of the itching of the meatus which is such a constant accompaniment of vesical calculi. There are many cases of stone in the bladder in which this symptom is not only the earliest and most persistent, but is practically the *only* one. Adenitis accompanying lymphangitis is another instance.

Contiguity is explanatory, apparently, of the spasms of the diaphragm so common in gall-stone colic.

Similarity in Structure it is said, accounts for metastasis of mumps, to the testicle particularly, and yet is not sufficient. It has been argued that certain organs of similar structure, when acted upon by some morbid agency, take on active morbid conditions by virtue of some accidental occurrence. That

other similar organs are brought to the verge of such a catastrophe, but the outbreak occurring in another, exhausts itself there. Now, with this predisposition, any slight exciting cause may well excite active morbid action in other similar structures. But this does not solve the problem of metastasis. It is one of the facts in pathology, and there are many such—where we must be content with the fact itself, the causes being undiscoverable.

Similar Nerve Supply must be a potent factor in a great many of those mysterious “sympathies” we meet. The occurrence of odontalgia, or the reverse—as a complication of facial neuralgia, is sufficiently common. It will also alone serve to account for the spasm of the diaphragm in hepatic colic, and the irritation of the meatus in vesical calculus.

Perhaps one of the commonest instances of sympathy is the pain in the knee accompanying the earlier stages of hip-joint disease. Here we have continuity in structure in the fascia-lata; similarity in structure is notable; similar nerve supply through the sciatic is apparent. Apparently all of these factors enter into the explanation, neither taking rank over the other.

It would be profitless, in the present state of knowledge, to discuss this question at greater length. We recognize the *fact*, and all else is mere speculation.

With reference to nervous influences, a word or two additional is needed. A nerve is practically a simple conductor; it originates nothing. The energy it transmits is originated at the center with which it has anatomical relation. An irritant applied or operative at the root of a nerve produces phenomena at its distribution. Gradually, if the irritation is continuous, the whole length of the nerve will become involved, because it is not an inorganic conductor. On the other hand, an irritant applied at the termination of a nerve will give rise to phenomena at that point, and later affect its whole distribution, and possibly related tracts will become involved. Similarly, irritants applied in the course of the nerve will gradually affect the trunk in both directions. These facts are mentioned

to call attention to the necessity for careful study in all so-called "reflexes," remembering that the lesion may be at the root as well as the termination, or even somewhere in the course of the nerve.

As to *therapeutics*, little is to be said. The symptoms are delusive, and afford little assistance in the selection of a remedy. They *may* be of value for purposes of diagnosis, and thus indirectly lead to proper treatment. In one sense, however, and in a certain class of cases, important therapeutic indications are furnished. When metastasis occurs, I think it good practice to secure a retranslation, if possible; for this purpose *arsenicum* has given me very excellent results. Even where retranslation is not secured, this remedy is often promptly curative.

V.—ANÆMIA

STRICTLY speaking, the word “anæmia” means a want of blood, and has reference particularly to a deficiency in *quantity*. Practically, or as the word is used in the profession, it means any inadequacy, either loss of property, or deficiency in quality, as well as a loss in quantity. The question has solely to do with the ability to carry on its function. The function of blood is quite complex; possibly it may be covered under three heads. An important function is as an excitant to function in the various organs, a sort of stimulating property. This is largely due to the oxygen carried, and consequently is more marked in the arterial system than the venous. Anything which would prevent proper aëration of the blood must rob it of the property conferred by the oxygen.

Another function is to repair waste, also an attribute of the arterial blood through the hæmatoblasts, leucocytes, and other organic constituents. Defects in assimilation of food, undue molecular waste, or some mechanical interruption of the current, must result in loss of nutritive properties, either relative or actual.

A third property is that of excretion, or elimination, the removal of worn-out material. This is very largely a venous function. It is a highly important one, however, as it is easy of demonstration that defecation is as important as nutrition, possibly more so.

We will see that the causes for any one or all of these changes in the blood are many, and that the loss of any one function must operate primarily as though a certain quantity of blood were withdrawn from the body. Pressure of tumors,

lesions of the respiratory apparatus, increased waste, imperfect food assimilation, or some error in the production or renewal of the blood, are all among the causes that may produce anæmia. In other words, the full and perfect functional attributes of the blood are dependent upon, *first*, adequate manufacture; and, *second*, normal circulation. The particular consequence of any such loss must depend upon many considerations, as whether the disturbance is general or local. The question of quantity is necessarily important, but the prime question here is as to the probabilities of renewal, that is, whether it is an abstraction due to accident, with the blood-making functions unimpaired, or a loss from deficiency in production. For convenience, therefore, we must study the phenomena attending general poverty of the blood, or *anæmia* proper; a local loss, or *ischæmia*; or an accidental abstraction, *surgical anæmia*.

Anæmia, without any qualification, refers to a general impoverishment of the blood, whether from loss in quality or quantity. We find that this condition may be pathological, physiological, or traumatic, otherwise surgical.

Physiological Anæmia is shown in the diminished blood supply during functional rest, and sleep. Any functional act, voluntary or automatic, determines an increased blood-supply; the cessation of the act shows a diminished quantity of blood in the part, or, as in sleep, a slowing in the circulation. Thus the tension in the vessels in different parts of the body is not at all times the same. It is quite uniform and stable in the large trunks, as the aorta and first subdivisions, but varies greatly in more remote vessels. Such temporary loss of blood is not only consistent with health, but is one of the evidences of proper physiological perfection.

Pathological Anæmia, on the other hand, is something standing for a defect in manufacture. The losses or modifications are of many varieties. There may be an excess of serum, relative or actual; or some change in the size of the red corpuscles, as microcythæmia, when they are too small; or macrocythæmia, when they are too large; there may be an

excess of white cells, as occurs in leucocythæmia; or there may be a tendency to coagulation, as in some fibrinous states of the blood, or the opposite, as in pyæmia, or some forms of toxæmia—where coagulation cannot be produced, the blood remaining fluid. There may also be a simple diminution in quantity, all the elements being present in due proportion, but the bulk inadequate. There is, of course, much variation in the symptoms produced by these varying states, and yet there are common characters. The changes in the blood are only to be detected by microscopical examination, which examination will often lead to a correct diagnosis as to the cause, and the particular function at fault.

The commoner general symptoms are as follows: decoloration of mucous outlets of the body, as well as the integument; lowered temperature, as a rule, with occasional flushing, and flashing of heat. The extremities are notably of low temperature; possibly the thermometer will show only slight falling, but the subjectivity is marked. Often, with the coldness, there is unnatural moisture. Sometimes it is only a *feeling* of moisture, on the part of the patient, none being observable on examination. The pulse is weak, rapid, or slow; murmurs are heard in the sub-clavian regions. Frequently there is œdema, particularly of the lower extremities, and under the eyes. The mouth is dry, not always with thirst; in fact, the mucous surfaces generally are dry. The urine is often scanty, the specific gravity sometimes high, and again low. The bowels are irregular, with a tendency to constipation, although in other cases the stools are more or less diarrhœic. Menstruation is irregular, scanty, pale color, and short duration. All the functions are more or less disordered; appetite poor and capricious; sleep light and unrefreshing. There is nearly always considerable emaciation, although occasionally it is not marked, and sometimes is disguised by a puffiness that does not amount to œdema.

While all classes of people, all ages, and of both sexes, are liable to anæmia, yet it is more frequently met with among women, particularly at the age of puberty, and the climac-

teric. After the establishment of menstruation it is more common among those who have borne children, particularly if the pregnancies have rapidly succeeded each other. It is of frequent occurrence in malarial districts, or in communities where endemic conditions induce the inhabitants to use much medicine habitually, notably quinine.

Therapeutics.—In a very large number of cases, the treatment will be hygienic, dietetic, or gymnastic. Habits of life must be changed; out-of-doors exercise enforced; clothing suitably selected, and in short, a general correction of faulty habits. Such items cannot be enumerated; they are to be governed by the circumstances in each case as they arise. There are many cases, however, in which the physician, from habits of routinism more than anything else, assumes all cases of anæmia to be of a character due to some faulty habits, and fails to look for some governing lesion. Possibly one-half of the cases occurring among young people are easily cured by such measures as have been alluded to. Among older subjects this is not true; the large majority are of true pathological character.

Remedies, in all cases, will greatly aid the hygienic and other measures, may even possibly cure without their aid at all. In the purely pathological cases they are *sine qua non*, no amount of merely hygienic measures will cure without their aid. By remedies is meant drugs given on homœopathic indications, not as foods, or stimulants, on any physiological supposition. If the urine is found loaded with salts of lime, it is far from being an indication to give it as food in massive doses. The fact that it is excreted is good evidence that there is enough of it, and that there is a fault in assimilation. The organism fails to take up that already supplied, and cannot take care of any additional amount. There are few remedies in the *Materia Medica* without some relation to anæmia; it will be impossible to mention even those most frequently indicated at any length. Perhaps, to put it roughly, the so-called “anti-psorics” are oftener called for. There are five that have probably been oftener used in my practice than any others.

Calcareæ Carb. This remedy must take first rank. The special indications are familiar enough. There is the puffy face, particularly the upper lip; the pasty complexion; coldness and dampness of the feet and hands; protuberant abdomen; shortness of breath; hacking cough; perspiration about the head and neck at night; "taking cold" easily, chilly; and tendency to catarrhal inflammations generally characteristic of the remedy.

Arsenicum Alb. The indications are very different from those of *Calcareæ*. The skin is dry, feeling parchment-like; palms of hands and soles of the feet hot; thin, scrawny habit; diarrhœa is a common occurrence, and is watery, hot, and very exhausting. Patient is apt to feel chilly, notwithstanding the hot hands and feet, and is very weak.

Apis mel. The indications are somewhat similar to those of *Calcareæ*. Puffiness of the face, particularly under the eyes; scanty urination; skin easily irritated and excoriated; œdemas, in different parts of the body, particularly the upper parts; biting-stinging in the swollen parts.

China off. The symptoms are typical of anæmia; ringing in the ears; faintness on rising up suddenly; diarrhœic tendency; great weakness; dimness of vision.

Ferrum met. Also the common symptoms of anæmia; particularly face flushes on every exertion; watery, painless stools, with little, if any exhaustion following. Bowels often constipated for days, and then a hard stool, followed by watery diarrhœa, containing undigested particles.

Sulphur. Something similar to arsenic. Skin dry, rough, and irritated easily; formication or itching when heated; water, hot or cold, aggravates the skin symptoms. Soles of the feet so hot, that the feet are kept uncovered at night. Diarrhœa, particularly early in the morning, with sudden urging.

Surgical Anæmia, is a loss of blood from accident, or surgical operation, and differs from pathological anæmia in all particulars. In the first place there is not necessarily any deficiency in the blood-making function. The reproduction is

usually speedily secured, unless the amount lost has been very excessive. The *immediate* consequences are of the first importance, dependent upon the amount of blood lost and the conditions attending it. When from accident, the blood-making function is presumably normal, and reproduction at once commences. When lost from surgical operation, there may have been some defect in this particular, and the repair will be slower. The symptoms are those of hæmorrhage and may be tabulated as follows: Faintness, rapidly increasing, with lowering of temperature, dimness of vision, ringing in the ears, and loss of color. There is usually great thirst. In extreme cases there is syncope, during which the hæmorrhage usually ceases, but it recommences with returning consciousness; then syncope again. In fatal cases there are usually convulsions before death. When the hæmorrhage is arrested, there will be profound debility, lowered temperature, mind more or less disturbed, particularly apathetic; thirst and ringing in the ears are quite persistent. On raising the head, syncope often occurs.

Treatment depends upon the amount of hæmorrhage and urgency of the symptoms. The objects are *first* to meet the immediate demand for blood, and next to hasten its reproduction.

When a large amount of blood is suddenly taken from the body, the consequences are first felt at the nerve centers, particularly the brain. In consequence of this the heart, in common with all organs essential to life, loses at once the stimulus furnished by the nerves governing it, and the loss of blood entering it. From the combined operation of these two conditions, syncope is produced. The recumbent posture has the effect to at once furnish more blood to the brain and to lessen the work of the heart. In all serious hæmorrhages, therefore, the recumbent posture must be secured, with the head low. If the symptoms still seem serious, or unabated, there are various forms of transfusion to be practiced, which will be briefly referred to, as the whole subject belongs more properly to emergent surgery.

Transfusion is the injection into the blood vessels of blood, human or animal, or its equivalent. It also refers to furnishing blood to the life centers from distant parts of the body. We find the process may be mediate, immediate, or auto-transfusion.

Mediate Transfusion is effected by collecting the blood from a donor, in some suitable vehicle, with facilities for maintaining a proper temperature, freeing it of fibrine, by "whipping," and then injecting it into the veins of the recipient. The dangers consist in the presence of fibrine, whereby coagulation may occur, and embolism ensue. Also of some objectionable character of the blood, from chronic morbid action particularly. At one time this method was quite extensively used, but the results have not been particularly favorable. Blood from the lower animals is not to be used.

Immediate Transfusion is the transfer of blood directly from the veins of the donor to those of the recipient, by means of a suitable apparatus. The principal precaution is to avoid the admission of air together with the blood. This method has given much better results than the former, but the final outcome has not been such as to give it an unquestioned place in therapeutics. It must be admitted, however, that the cases in which it has been employed were of the most desperate character, and while immediate improvement has been the rule, the later results are not good at all times.

Auto-transfusion is a purely temporary measure, but one of great value. It is secured by bandaging the extremities, lower or upper, or both, with elastic bandages, driving their blood to the centres. If reproduction of blood is active, it may prove a curative measure, care being taken to remove the bandages one at a time, with an interval of some minutes between—to avoid a too sudden abstraction of blood from the centres, or in too great quantities. The last bandage may, on occasions, be continued for two, or even three hours; probably the first one should be removed after an hour, or a half hour longer. Less energetic methods of auto-transfusion have long been known and generally practiced, if not for

surgical anæmia, at least as prophylactic. The most common is secured by elevating a member, and stroking it, towards the body, with the two hands, thus emptying the veins, the position operating to retard their refilling.

There are many compromises with transfusion, the most common being milk, and the so-called "normal saline solution." Milk has almost entirely ceased to be used, for many reasons. The saline solution is growing in favor, and many brilliant results have been secured. It is particularly useful in true surgical anæmia, that is after severe hæmorrhage, where there is fair promise of ample reproduction of blood. Whether it acts as a pure stimulant, or by furnishing resistance to the heart and vessels by giving them something to *act* on, or by a direct influence on the blood-making function, or by its influence directly on protoplasm, or by an association of all of them, cannot be definitely said. It is prepared according to the following formula:

Distilled water, 2 pints; common salt, $1\frac{1}{2}$ drachms; liquor sodæ, 20 drops. The "normal serum" of the biologist is one-sixth of one per cent. of salt; the soda, however, seems to be an important ingredient. One or two pints, or even more, of course of proper temperature—have been injected into some large superficial vein, in cases of impending death, with instantaneous improvement in pulse and temperature, and good recovery. In homœopathic practice, no matter what form of transfusion is employed, *China* must always be given, from its known influence on the blood-making function.

Ischæmia.—This form of anæmia is purely local, limited territories being deprived of blood in various ways. Thus the pressure of tumors; the obliteration of vessels from any cause; the pressure from dislocated joints, or displaced fragments in fractures, are among some of the common causes. The consequences depend upon the extent of the process, and the cause. When from pressure, or such conditions as ligaturing vessels, or almost any form of purely mechanical obstruction, the circulation is reëstablished (collateral circulation), and no permanent damage is done. When

it is caused by morbid action, such as embolism, or inflammation in small vessels, ulceration is probable; when the same conditions occur in larger vessels gangrene will follow. Again if vessels essential to life are affected, or the parts supplied by the vessel are of the first importance, death will ensue. Thus embolism of some of the cerebral vessels, will produce ischæmia of the brain, and imperil life; so with the pulmonary, hepatic, or coronary arteries.

Treatment is simple in theory, but often extremely difficult in practice. The first indication is to remove the cause, of course, if that can be reached. By external warmth, position, and possibly friction, collateral circulation may be hastened. Also, when embolism is recognized, *Arnica* is used to hasten absorption, massage, if accessible, may break it up, the fragments going to smaller and possibly less important vessels.

Scale and Bell, have been useful in such cases, when the symptoms call for them, as indeed will any other remedy under the same circumstance. In the absence of symptoms, however, on purely general indications, *Arnica* is the remedy that would be first suggested to the homœopath.

VI—HYPERÆMIA

As was found to be the case in anæmia, the conditions of hyperæmia may be physiological or pathological. The term refers to an over supply of blood, local or general, relative or actual. The term "plethora" means a general increase in the amount of blood in the body, or such a change in its composition that it might be considered "post perfect," as POLAND has it. The term "hyperæmia" refers to a local excess, standing as the opposite to *ischæmia*. Plethora being a condition almost wholly medical in character, or in the domain of general pathology, concerns us but little at this time; an account of the phenomena attending hyperæmia will be sufficient for the purpose in hand.

All functional acts are accompanied by increased amount of blood in the parts concerned, already alluded to in an earlier paragraph. This is occasional, and passes away, under normal conditions, leaving no lesion behind it. It is essential to functional activity, and has no pathological significance whatever, unless too frequently repeated, or the irritant is of undue intensity, or prolonged application. In one case it will be a protest against an irritant, constituting the semi-pathological state already referred to, known as irritation. In another case it will be an element in repair, after injuries of any kind, and while of higher grade, and more persistent, is still physiological because the outcome is conservative, and not destructive. Should the condition outlive the emergency, however, and be accompanied by some degeneration in structure of the part involved, pathological characters are then assumed.

Viewed as a purely accidental and temporary occurrence,

or as associated with purely mental emotions, as in the act of blushing—the process is exceedingly simple. But when it results from injury, or from morbid influences, one of two things is evident: either the state will pass over into inflammation, or it will remain as a reparative process. In either case the blood will undergo a notable change, and assume some character not present under other circumstances. In the physiological forms, purely, attendant upon function, the blood is not in any sense changed; the sole phenomena is increased amount. In repair of injury, there is a change in composition, but only by the addition of the elements for repair in unusual amount. It is still physiological, to all intents and purposes. In commencing inflammation, it has undergone changes that render it unfit for nutritive purposes, and hence the condition is pathological. Furthermore the tissues are imperilled thereby in various ways.

Experiments have shown that the effects of irritation of nerves, governing the circulation of the blood, so far as it is influenced by contraction of the vessels, varies with the point of irritation, *i. e.* whether peripheral or central. The blood circulates in the vessels through the combined agencies of the heart's contraction, the dilatation and contraction of the vessels themselves (resiliency), the automatic action of muscles lying in close relation, and to some extent, the action of gravity. The dilatation of the vessels is due almost entirely to inter-vascular pressure from the blood forced in by the heart's action, the muscular fibres having no power to dilate the vessel other than by ceasing to contract, and thus yielding to the pressure from within. The contraction of these fibres, however, is under the control of the vaso-motor system, which, I am of the opinion, has a partially inhibitory influence, the direct stimulus to contraction being probably the same as in the case of the heart itself. I am aware that STRICKER, of Vienna, holds a different doctrine, which will be found fully elaborated in the *International Cyclopædia of Surgery*, Vol. 1. He there attempts to show that there are two sets of vaso-motors, one *dilating* and the other *constricting*. His arguments are

ingenious, but almost entirely unsupported by demonstrable facts, being furthermore opposed, it seems to me, to the usual if not uniform principles of vital mechanics, if the term may be allowed. It is not shown that a vessel, or any other tubular organ, has been observed to expand or dilate independently of the introduction of interior tension or pressure. Now a direct irritation of a part, as a prick with a needle, or the application of a concentrated acid, will show a momentary contraction of the vessels, at times so short in duration that it may entirely escape detection. If the irritation is central, however, say at the ganglia or root of the nerve that supplies the system of vessels under observation, the immediate effect is dilatation. This difference is not without significance.

The contraction of the vessels, in the first instance, is due to a sudden, almost tetanic muscular effort, the subsidence of which leaves the fibres exhausted or momentarily paralyzed. In the second case, when the irritation is central, the vessels are dilated from a suspension of nervous energy at its source, the muscular fibres becoming relaxed from this cause. These different states will require separate study.

A constriction, even momentary, in the course of the current of the circulation, will not have the effect that narrowing the channel of a river would have, which is to increase the rapidity of the current; it retards, during its duration, the whole current of the blood. This retardation is followed by a corresponding quickening of the current upon the release from constriction, only to a certain extent, during which time a greater quantity of blood passes through the part than is usual, for a moment raising the temperature slightly, and giving an increase of color in superficial parts. Now the plasticity of the blood depends upon the relative amount of albuminous elements present, and the reparative ability of the blood is directly in relation to the same consideration; an amount of blood compressed into a space ordinarily occupied by a much smaller quantity, will contain, as related to the tissues of the part, much more plastic material. This induces a relative change in the character of the blood peculiarly fitting it for reparative

purposes. More than this: the dilatation being of longer continuance than the period of contraction, the impulse to the circulation is lost, at this point, from the inaction of the muscular fibres, and the larger amount of blood is slower in passing through the dilated vessels than before the contraction occurred.

This has still another significance. The vessels affected by this dilatation while furnishing ample accommodation for the influx of the increased amount of blood, does not furnish increased facilities for letting it out. This operates as an additional barrier to the restoration of the equilibrium, and makes the period of dilatation far exceed in duration that of contraction. Furthermore, all of these various interruptions greatly add to the plasticity of the blood, increasing as SIMON says, its "fibriniferous character."

What has been said may now be summarized as follows: Local, or peripheral irritation, causes primary constriction, and secondary dilatation of the vessels involved. The dilatation practically increases the plasticity of the blood. The increased plasticity so alters the characters of the blood that reparative material is at once at hand to repair the damage done by the irritant. The continued action of the irritant, as in wounds, or the frequent repetition, as in habitual pressure or friction, causes such a lesion that the demand for repair induces what the old pathologists called "adhesive inflammation," but what is now known to be a purely physiological process, although somewhat exaggerated, as given above.

Supposing the irritation has been so severe, or of such a character, that the capillaries are torn and extravasation of blood occurs into the surrounding tissues, we have the same state of affairs intensified. The coagulation of the effused blood forms a material barrier to the continuance of the circulation. The conditions are now favorable to inflammation, but whether it shall be set up, or active repair, will depend upon other contingencies to be studied later. It may be noticed at this time, however, that there is a condition in hyperæmia, particularly when attendant upon processes of repair, that

might lead careless students to suppose there was some identity in the processes; this is the appearance of white blood-corpuscles in the tissues of the part. We will learn later that in the case of inflammation, these lymphoid bodies make their escape through the walls of the vessels by *vital* processes, apparently inherent. In the case of traumatic hyperæmia the escape is made as elements of the blood, through the wounded vessel. One represents an accident, the other a design, and are consequently not identical either in method, purpose or significance.

This is a fair *résumé* of the state of knowledge of hyperæmia where there is no pathological alteration in the blood, and where the irritation is peripheral. Let us now enquire what the differences are when the irritation is central, as in blushing.

Central irritation as has been already remarked, produces primary dilatation of the vessels under the influence of the nerve or ganglia irritated. The condition is similar to mental emotions, with this difference, however, that the primary disturbance is in the heart, whilst, when other causes prevail the heart partakes secondarily. For instance, under central irritation muscular action in the middle coat of the vessel is suspended; it is not a localized condition, but extends throughout the whole system of vessels under observation. For the reason that it is general, the volume of blood in the part is greatly increased, the suspension of contractility resulting in a relatively slower egress than ingress. When this is evanescent a strong contraction at once comes on, emptying the vessels as fast as they were filled. The sudden rush of blood in these enlarged vessels to some considerable extent empties the sources of supply interior to them, automatically causing a deep or hurried inspiration, having the effect to cause an equally forcible cardiac contraction, which instantly fills the partially depleted vessels, perhaps increasing the tension. The tension being increased there is a stronger reactionary contraction than usual, the effect on the vessels being slightly anæmic; and this oscillation goes on until equilibrium is restored. Now in all these conditions there is no change in

the *character* of the blood, for the double reason that there is no retardation in the velocity of the current, and no lesion to repair. The process is purely one of irritability, a temporary exaltation of function.

Suppose the heart is primarily affected by mental emotions, the first effect, in some instances, is an interruption of rhythm, followed by a powerful and spasmodic contraction, forcing an unusual amount of blood into the vessels, producing extraordinary increase of tension. There is no special irritation of the muscular fibres now, they do not necessarily partake in the cardiac irritation, the vessels being dilated simply from the suddenly increased quantity of blood thrown into them. This sudden distension is followed by reactionary contraction, and pallor succeeds the primary flushing of the surface. The *kind* of emotion, for reasons not understood, exercises a peculiar influence as fear, joy, etc., the expression of which is well known, and the explanation readily found in the foregoing paragraphs.

There are circumstances where in lieu of irritation of a nerve there is actual paralysis, as when a trunk is divided or strongly compressed. The vessels now dilate as when from irritation, but it is *permanent*; the blood circulating in the part only by the impulse derived from the heart, the action of gravitation and the slight pressure of surrounding muscles; the contractility of the vessels is lost. If the current happens to be ascending, as in the cranial region, gravitation is not only lost as a factor in the circulation, but is turned into an opposing element. Under these circumstances stasis of the blood is imminent, a point has been reached where hyperæmia almost inevitably passes over into inflammation, and our studies in this direction have reached their limit.

We are now prepared to understand that the prodroma of morbid states are not necessarily morbid in themselves; they are simple functional excitements which may cross the line and become organic lesions, or subside, leaving no trace behind them. Thus the irritant, tangible or intangible, material or emotional, "frets," or excites the part under its influence;

the continuity, contiguity and nervous relation with other parts, near or remote, induces a sympathy in the perturbed function; the combined effect of irritation and sympathy, induces more or less hyperæmia, or vascular excitement, and other conditions now determine the results.

What has been written, however, on these semi-pathological conditions, must be taken as a simple preface to an immense field for study. The topic is of as much interest to the physician as to the surgeon, and must enter more or less, into all his conceptions of etiology. It is impossible for the student of surgery to shun this enquiry, as it includes the elements of the science of his calling.

Therapeutics.—The treatment of hyperæmia, when it assumes pathological characters, is very simple in the acute form; *Aconite* is the typical remedy, and will rarely fail in bringing about full reduction. In chronic cases, the list of remedies is a long one, but as the condition is then practically an inflammation, the special indications will be found under that head. Palliative measures are quite valuable adjuncts, rest taking first rank. As to heat and cold in this connection, possibly there is room for much difference of opinion. The fact is, I think, that when a rapid effect is required, cold applications may be preferred, as the vessels are at once emptied. But the reactionary stage will quite surely reproduce the difficulty, possibly in a somewhat exaggerated form. Where the emergency is not particularly pressing hot applications are to be preferred. The primary effect will be to increase the volume of blood in the part, but the stage is of short duration, soon succeeded by a diminution in the size of the vessels, which is practically a permanent condition, and therefore curative.

VII—SURGICAL REPAIR

Repair in physiological language, is restoration from molecular loss or waste. It is something more than this in surgical language, it is the attempt to replace lost parts or tissues, to fill gaps caused by injury or gross lesions. It is of fundamental importance that the surgeon should understand the methods of repair, it being a question of daily and hourly interest to him. The attempt, on all occasions, that the organism makes, is to replace the lost tissue in kind and bulk; it is safe to say that it is never fully successful, the bond of union, or the new tissue, is at best more or less a caricature of that which has been lost. By thoroughly comprehending the process, the surgeon is enabled to materially assist the natural forces, by suitable medication, to remove all impediments from the way; and, furthermore, will be able to select the most appropriate treatment in a given case, knowing beforehand the manner in which his work will be completed.

Essential to repair, is a certain amount of irritation, with its consequent hyperæmia, care being had to prevent, as far as possible, the crossing of the boundary line into inflammation. While irritation is so essential to perfect or typical repair, its source and character is such that there is constant danger of its becoming too energetic for the purpose in hand, and calls for restraint far oftener than stimulation. The occurrence of an injury is at once a demand for repair, and a cause for its establishment. But two stages are clearly marked, varying in duration, and some other particulars, with circumstances such as extent and kind of injury. The *first stage* or that of *passive repair*, is one of preparation, or rather elimination.

The *second*, is that of *active repair*, when germinal elements are furnished, and organized into the required tissue. These stages require separate consideration.

First Stage.—The first effect of an injury, such as a wound in the soft parts, will be driving back the blood, momentarily, with some degree of “local shock.” This shock, at times, may continue for an appreciable length of time, but is often momentary; during its continuance function is suspended. Shortly, however, comes a reactionary effort, function is exaggerated, and the blood which had been driven back, rushes forth with unusual violence. Whether the hæmorrhage ceases spontaneously, or is arrested by art, the conditions are the same, *viz.*, a plugging up of the cut extremities of the vessels. The prominence of any one or all of these phenomena, is determined by the *kind* of injury, a smooth cut or a crushing and tearing wound, and to the rapidity with which it is inflicted; the more rapid the force operating on the wounded tissue, the greater the tissue-shock; the smoother the tissues are divided, the more profuse the hæmorrhage. The first part of this stage of repair is occupied by the reaction from shock, and the control of hæmorrhage. These being accomplished, the remaining portion is occupied in eliminating from the wound anything that may prejudice repair. Any foreign material, organic or inorganic, will interfere with union, and hence the wound must be in a state of true asepticism before this stage can be completed. The stage may be materially shortened by the surgeon’s care to remove all visible and detachable foreign material, and the absolute arrest of hæmorrhage; but even when all this is done, there is much, in the majority of wounds, that escapes the view of the surgeon, and which nature gets rid of in her own way. Part of it undergoes change of some form, and is absorbed; part of it is liquefied and discharged; and part is “squeezed” out, as it were, unchanged, by the gradually increasing tumefaction of the part. This stage is completed when the wound is absolutely clean, and the severed parts ready for union—yet while this is going on active repair is not altogether in abeyance; it is true there is no

appearance of germinal elements for the new tissue on the surface of the wound, but they are accumulating, gathering their forces on every side, so that the tissues are filled, which accounts for the tumefaction in part. So, then, it is seen the irritation produced by the foreign elements, and that from the effort to dispose of them, is essential to call into activity forces that shall restore, in more or less perfect fashion, the lost continuity.

Second Stage.—This stage is the one of active repair, in which elements of the new tissue to be made up appear on the surfaces of the wound, and the capillaries undergo important changes to perfect the work. The medium of repair is the organic cell, derived in this case, from a multitude of sources. ZIEGLER has shown (*Path. Anat.*) that each tissue produces germinal reparative matter that is peculiar to itself; bone produces bone, muscle produces muscle, or something of its own type, and of the general design when the organization is completed, but never a perfect reproduction. The result is, there is a wound which leaves a gap to be filled with new material, involving a number of unlike tissues, as bone, cartilage, muscle, nerve, connective-tissue and epithelium—each of them furnishes, by proliferation from their cut extremities, cells like their own. The blood furnishes numbers of leucocytes, the lymphatics likewise, and from this mass of cells, of varying origin and destiny, the new tissue is to be made. These cells are seen to be disposed in a sheet or film, collectively known as lymph or plasma, covering the raw surfaces, becoming thicker, by sub-deposition, until the gap is filled up. On microscopic examination nothing distinctive or pathognomonic is found in these cells; they all look alike, and it is not until repair is well inaugurated, that we can detect any attempt at differentiation. The connective-tissue cell is predominant, being proliferated in greater numbers than others, and commencing organization earlier. This proliferation is beyond ordinary demands of the organism, and is determined by the irritation caused by the infliction of the injury, the effort at elimination, and the hyperæmia consequent upon both. The

cells are first of the typical spherical shape, later changing form, from their original or inherent property, or from the nature of surrounding circumstances. The older cells being at the top, and center of the cavity, the changes of form are first observed there. In studying them from the youngest cells upwards, we will note that they first become oval, then fusiform, and lastly very slender, with long filiform extremities, which become interlaced, or felted together. But the upper layer of cells are derived from the epithelium, and are spread over the surface, flattened like the epithelium from which they are derived.

If the cells from these various tissues were thrown out with equal rapidity, and in proportional numbers, the new tissue might be a reproduction of that which was lost. This is not the case. The connective-tissue cells are in immense majority, and by compression as they organize destroy multitudes of cells from other sources. When the new tissue, or scar, is completed therefore, the characters are largely those of fibrous tissue, a felted network, contractile, of low vascularity, and insignificant nerve supply. Notwithstanding the numerical preponderance of connective-tissue elements, the chief factor, or at least the initial one—is the leucocyte. The leucocyte is probably a stimulant to proliferation, in the first instance, and formative secondarily. The connective-tissue corpuscle is formative only. Occasion will occur later to treat of the genesis, function, and destiny of the leucocyte; at this time I will assume as a fact, about which I cannot entertain a doubt—that the leucocyte *is* migratory under proper conditions. When this occurs, as COHNHEIM and others have shown, it first stimulates connective-tissue cells to renewed activity, and later contributes itself to the resulting organization. A certain amount of irritation is necessary to render active this genetic property in the white cell. Those white cells which appear in the tissues from the extravasated blood, are not at all times active; they are often appropriated by the young cells, for nutriment, or degenerate into pus cells. So also with the lymphoid corpuscles derived from the lymphatics.

To act as stimulators to the formative elements, the white cell must be in the condition we call "migrating," out of the blood current. This is caused by the irritation accompanying the injury, and is thus described by ZIEGLER (*l.c.* 150), using the term "inflammation," however, where I prefer to use hyperaemia: "The factors which cause the inflammatory process to take on a formative or constructive character are not always the same. We must in general assume that some cause is acting which keeps up the morbid alteration in the vessel walls, and so gives the inflammation in some degree a chronic character. In open wounds the inflammation is kept up by contact with the air, with the floating matters suspended in it, with the dressings, with the secretions from the surface. This continues till the skin, growing over the margin of the wound, at length protects the vascular tissue from further irritation. In subcutaneous necroses following an acute exudative inflammation, the dead tissues, or dead exudations are enough to maintain a certain irritation in their neighborhood, especially as they undergo certain chemical changes before they are finally absorbed. In other cases, the original cause of injury persists, and continues to excite even fresh inflammation; or a new injury may affect a part in which inflammation is declining or over-past, and kindle it afresh. Which of all these possibilities applies to a given case, is often hard to determine. Very frequently several such factors are in action, either at the same time or at different stages of the process." So much for the sources of the irritation, and the consequent germinal elements. Next to claim attention is the manner of organization.

In a former paragraph attention was called to the changing shape of the cells. This change is largely due to the inherent property of the cell, it is true, but it is also greatly influenced by the immediate surroundings.

A cell has a certain direction given to its growth by the form, consistency, and other characters of the parts from which it comes, or which it meets. Thus all connective-tissue corpuscles normally develop into the fusiform or "spindle-cell."

organization. When scanty it shows lack of material; when ill conditioned in any way, some defect in repair; when watery and acrid, some destructive process; when suppressed, an arrest of repair, absorption of septic material, or some active morbid process. In a later chapter these conditions will receive full attention. While the genesis of the cellular elements of the new tissue is of such importance and interest, there is still another, and equally momentous process going on, one which, if absent, would render the attempt at repair abortive. This is the vascularization of the new product by development of blood-vessels. The growth of blood-vessels into the granulation-tissue takes place from the capillary system entirely, or inosculating branches of small vessels, which are little more than capillary in size and structure. The cut extremities of these minute vessels are closed partly by some degree of introversion of their walls; but chiefly by coagulæ, giving a bulbous appearance, on the surface of the wound. Shortly there are buds, or small projections, on the sides of the extremity, which later become branches reaching out to meet similar branches coming from other vessels in the neighborhood. Sometimes the offshoots are tubular from the start; at others they are solid protoplasmic cylinders, which later become tunnelled (vacuolation). From opposite sides of the wounded surface, these vessels reach out to meet each other, when meeting fusing together. In their growth they meet obstacles, of various kinds, which determine a further subdivision, or sending off intercellular offshoots, until, reaching out from all sides, they gradually meet, join, and a net-work of vessels is completed, ramifying in every direction among the elements of the forming tissue. The number of vessels being far in excess of the usual supply, in territories of similar dimensions, determines a greatly increased supply of blood, which is needed for the purpose immediately at hand, but which is finally reduced to something almost as much below the normal standard.

The separated parts being united, or the gap filled up, and the surface covered with epithelium, the *formative* process is

complete. A study of this new tissue shows that it cannot be considered a reproduction, there being such an excess of connective-tissue; it represents a *bond of union*, and nothing more. The irritation now subsides, the proliferation of cells ceases, and we have a highly vascular, sensitive and thinly covered tissue, of a darker color than the surrounding parts, somewhat elevated also above the surface. The process is not yet complete; the normal character of scar-tissue is of low vascularity, and defective organization; as we find it at this stage, it is super-normal and must undergo some metamorphic process. This is secured by contraction, or shrinking which is a common feature in all scars, greater under some circumstances than others. Under this action blood-vessels are "choked" and disappear, nerve fibres atrophy and waste away; the scar becomes flattened to the level of the surrounding skin, sometimes sinks below it, assumes a paler color, even white and colorless, and becomes insensitive. Occasionally these changes go too far, under some morbid influence, and the scar is very depressed, may even disappear, or take on other and hypertrophic characters. This will be deferred, however, until a later paragraph. In closing this branch of the subject, it will be sufficient to call attention to the fact that the scar once formed is permanent, and while constantly approaching closer and closer to the normal type, to the end of life will remain as something short of perfect reproduction. It grows with the growth of the body, so that, as PAGET has said, "a scar the length of the child's little finger, will be that of the man's when he comes to adult life."

We have now taken a rapid review of the facts established of surgical repair in general, but have still to give some attention to various modifications. Different writers give varying methods of repair, but it would seem that the list might conveniently be compressed into four varieties. Immediate union; union by first intention; granulation; and under a scab, or subcutaneously.

(a.) **Immediate Union** is the only form of surgical repair in which scar-tissue is not formed. It is a direct adhesion of

opposing cut surfaces, without exudation, or any of the ordinary concomitants of repair. To secure such a desirable union, the wound must be smoothly incised, absolutely free from foreign material of any kind, closely and accurately approximated, and all disturbing influences excluded. There is, probably, cell-proliferation, but the fact is difficult to establish from the entire absence of a scar; the parts have the same appearance they had before wounding. The probabilities are that each divided fibre is united by simple fusing. *Staphylococcus* has long enjoyed the reputation of promoting repair such as this: The fact that the minimum of irritation is required may be the reason for its indication, from its marked power in quieting muscular excitement. I have many times secured such union, when the incisions were smoothly made, and coaptation perfect; oftener, however, such results were only in a part of the wound.

(b.) **Primary union**, otherwise union by *first intention*, is the commoner method of repair observed in surgical practice. It is in all particulars identical with that already described, the typical form of the process, particularly occurring when the depth of a wound, or its linear extent is greater than its width; that is, in all lesions where parts are divided, but can be approximated. The union is secured by binding together these divided structures by the interposition of cicatricial tissue. As far as mere continuity of an organ is concerned, repair is adequate providing the organ has not been completely severed; in this case there will be impairment of function, transient or permanent, depending upon the nature of the part. Thus if a *muscle* is completely divided, and union is of this sort, the action of the muscle is completely destroyed; that is *full* action. The muscular force is designed to be exerted from its origin to its insertion; the interposition, somewhere between these points, of a scar will transfer the insertion of the proximal portion to the scar, and the origin of the distal to the same point. Now the contractions are in both directions from the scar, and the full utility of the organ is lost. The shorter portion sometimes atrophies, and may

disappear entirely. In the case of *nerves* the same considerations obtain, with this difference, that in favorable cases, that is where there is not too great dispartition—nerve cells may proliferate downwards, and ultimately reëstablish communication. This, however, is a work of time, and often the distal extremity will be found totally destroyed by trophic changes, making reïnervation impossible. Continuity of *vascular supply* is secured in two ways. Capillary organization is accomplished as already explained. Larger arteries furnish collateral channels of communication. An artery being wounded, and the end inverted or secured by ligature, it assumes the general shape of a test-tube. If the bottom of a test-tube be filled with sand, and an opening made in the side of the tube some distance above the sand, on pouring water into the tube it will be seen, by motions in the sand, that the stream is divided. One stream passes directly out of the opening; the other strikes the bottom of the tube, and is thrown back in a spiral form, churning up the sand with it. The same thing occurs in the case of a wounded vessel, with this result: the churning motion of the one stream hastens or promotes a fibrinous clot in the bottom of the vessel, which, when built up to the level of the first opening is prevented from going higher by the constant passage over it of the whole stream of the blood. The clot then commences to organize as granulation-tissue has been described, and the collateral vessel becomes gradually enlarged until the dimensions are the same as those of the parent vessel, or sufficiently near it to equalize the tension.

It must not be forgotten that repair is not perfect reproduction. We found that soft tissues united by new fibrous tissue possessed very few, if any, of the normal characters. That nerve tissue is only incompletely reproduced, and then only after long periods of time. Even the new epithelium is thin, and depraved. In the case of hard structures, like bone, there is a similar state of affairs. Plasma is poured out around and between the ends of the fragments, after the foreign material has all been removed—an ensheathing or *pro-*

visional "callus," as it is called. Afterwards, a definite organization, of such portions of it as may be needed, takes place, known as permanent or *definitive callus*, when the provisional portion is absorbed. Now on examination of this bond of union, it is found to have many of the characters of bone, but is much more dense and compact than bone ever normally becomes, and so fairly represents the "caricature" of the tissue of the part already studied in the case of the soft parts. It is precisely the same process as occurs in union by first intention in soft parts. Bones *may* unite by immediate union, where there has been no displacement of the fragments, and then we find no signs of deterioration in type. The reparative material, in both cases, however, is derived from the bone itself, the *osteoblasts*, and not from the periosteum, as was formerly supposed, whose sole purpose is one of nutrition. *Remedies* play a highly important part in promoting repair by this method. In the case of soft parts generally, *Calendula* is to take first rank; it may be given internally, or used topically, with a preference for the former, for the following reasons: The perfectness of repair must be in direct proportion to the supply and utilization of reparative material. Anything which adds to the water of the plasma, must naturally dilute it and lessen its potency; furthermore, if the application of water is liberal, germinal elements will be washed away. If *this* danger is sought to be avoided by using cerates or ointments medicated with *Calendula*, the oily matter will become mixed with the corpuscles, separate them, and necessarily prejudice their organization. In the case of bones *Symphytum* will take the place of *Calendula*, but if union is tardy *Calcareo phos.* is to be preferred.

I have already referred to the indications to be derived from a study of the pus. The matter will be referred to later, under its proper head (Suppuration) but the following suggestions may be appropriate:

Pus too profuse, normal in character, *Iodine*.

Thick, scanty, streaked with blood, *Bellad.*

Profuse, green, or bright yellow, *Puls.*

Thin, watery, brown, cadaverous odor, *Silic.*

Thin, watery, light-colored, viscid, putrid, *Graph.*

Thin, watery, lemon-colored, cadaverous odor, *Merc.*

Thin, watery, cheesy smell, *Sulph.*

Milky, not offensive, *Lycop.*

Milky, curdy, *Calc carb.*

Thin, dark, bloody, *Lach.*

Suppressed, *Arsen.*

Smelling like brine, *Graph.*

Of course other general indications must be sought for.

(c.) **Union by Second Intention** (or, as otherwise known by "granulation,") is very similar to the last, but with a somewhat different, or modified result. There is the same proliferation of cells, as in the former case, but in place of being disposed in a sheet or layer, they are heaped up, showing to the naked eye the appearance of a rough, mammillated surface, the elevations being composed almost entirely of lymphoid cells, around and among them capillaries ramifying, in every direction, terminating in loops on the top of these "granulations," as the elevations are called. The granulations gradually increase in size, becoming more and more prominent, encroaching on each other at their bases, capillary communication being established on all sides, until, finally, the whole cavity is filled with them, reaching above the surrounding level. Such a mode of repair is effected in wounds with great dispartition, or when the superficial extent exceeds the depth, as in the case of ulcers or wounds with loss of substance. As the cells multiply, and the granulations increase in size, the deeper or older portions of the mass become firmer and compact, taking on the same characters of organization as were shown in union by first intention. At the same time, in typical cases, the area of the granulating surface is constantly diminishing, from proliferation on the sides, and a growth of epithelium from the edges. This epithelial growth covers the granulations, as they reach above the surface, and when complete deeper proliferation ceases, but the new tissue is somewhat elevated above the surrounding parts. Contraction now

commences, having the effect to reduce the prominence of the scar, which in most cases becomes slightly depressed. In typical healing by this process, the final closure of the wound is from the edges toward the center. A different process, from the center toward the edges, does not promise perfect repair; in most cases it will not be completed; the wound will break open again.

The remedy of first value in this form of repair is *Calendula*, but defects in this process may call for others. The condition is, to all intents and purposes, one of ulceration, and is to be treated as such. Accordingly questions of therapeutics will be referred to that chapter. The process will be much facilitated, it will be observed, if pressure be exerted in such a way that the area of the wound will be diminished, and yet not to an extent to prejudice vitality. Judicious bandaging and strapping will therefore be useful.

(*d.*) **Healing Under a Scab**, or Subcutaneously:—In the case of a purely subcutaneous wound, one in which the exposure of the wounded surfaces to the air does not occur, the process of repair is very nearly the same, as far as results are concerned, as when immediate union takes place. The same thing occurs in union “under a scab,” if the crust remains unbroken to the end. Such wounds are tenotomies, as made intentionally, or rupture of tissues, by contusion or otherwise, without lesions of the integument. The scab referred to, is formed by inspissation of the lymph, mixed often with some innocuous foreign material. Undoubtedly the stimulation of the air, in open wounds, has much to do with keeping up the degree of irritation necessary to a profuse exudation and cell-proliferation. The exclusion of the air, as it occurs, when the epithelial layer is deposited, seems to cause a subsidence of this proliferating process, and the fact would tend to show that the differences, to be noted later, are due to the exclusion of the air, with its consequent irritation. There is still another factor that may possibly play an important role, namely the capacity of the part in which the exudation occurs. The fact will be recalled, that when the breach to be closed is filled with granu-

lation-tissue, there is rapid subsidence of the process, as far as *production* is concerned—even before the epithelial covering is formed. It is more than probable that as soon as the space between the divided tissues, in subcutaneous wounds, is filled with germinal matter, as well as the looser connective-tissue in the neighborhood, the production ceases. The fluid portions of the lymph are certainly rapidly absorbed, and the reparative material is then almost entirely composed of corpuscles in the most favorable condition possible for speedy organization. Whatever the process may be, the *results* are vastly different from repair by any other method. In true subcutaneous wounds, the new tissue is a more complete reproduction of the old, so much so, that in favorable cases no difference can be detected between them. In the new tissue formed under a scab, there is often an almost entire absence of contraction, so that the parts are not disabled, and few, if any adhesions to near structures. The whole matter seems to be one of those occurring too frequently in pathology, in which the clinical facts stand for our sum-total of knowledge.

The therapeutic interests are few, and the indications plain and unmistakable. The *first* is to protect the scab, by all means, to prevent the admission of air. Should union by first or second intention fail, the surgeon might do well to place the parts in a condition favorable to scabbing, by the use of collodion or absorbent cotton, or some other material, that will be allowed to remain until spontaneously detached. Topical treatment, of all kinds, must be forbidden, and *Calendula*, or other remedies, given internally. Should pus collect under a scab, it can be allowed to escape at some accessible point, and a study of its character will furnish information as to what is going on within. Could healing by this method be assured, it would be the first aim of all practitioners. Unfortunately it often fails, in meeting all the essential conditions, and repair by granulation must be accepted.

What has now been said gives a fair account of the various uncomplicated conditions of surgical repair, but as is too often the case, there are numerous obstacles to success; there are

many defects, trophic and specific in character, that must not fail to receive attention. Defects are of two general kinds, the one relating to the process, the other to its results. That is there may be a failure to unite, or union having taken place, the new tissue is inadequate.

Failure to Unite, an absence or feebleness of the reparative process, may be active or passive. It is the latter when the individual is old, or enfeebled in any way. It is the former when the existence of some morbid action, acute or chronic simulates the conditions of senility. It goes without saying that the organism cannot, as a rule, carry on two important processes at the same time, with perfect success in both directions. Under the influence of acute disease, the whole powers of the body are concentrated on the single vital task of resisting its encroachments and repairing its ravages. Under these circumstances a call for surgical repair cannot be fully met, from the simple fact that there is little or nothing to meet it with; every such demand must, in the nature of things, borrow from the forces operating elsewhere, thereby at once enfeebling those going on for the general good, and inadequately furnishing help to the special emergency. In surgical practice this condition of affairs is unhappily often met, and seriously compromises results in the best managed cases. Should the malady be a chronic one, the condition of the organism represents that of senility, a condition fatal to successful or speedy repair. If the malady is specific, perfect success is impossible from the poor quality of the reparative material. There are, therefore, very many contingencies met in actual practice that can scarcely fail to prejudice typical repair. There is one, however, the most potent in point of frequency, namely the occurrence of inflammation. Repair is at once arrested when acute inflammation occurs, and it is this fact which prompts me to discard the word entirely in speaking of processes so purely physiological. In normal repair there is nothing of a pathological character; it is a simple exaggeration of an ordinary physiological process, continually going on in the life of the organism, although the waste consequent thereupon might possibly give it a semi-pathological character.

Defects in Scarring, represent, in most cases, a plus or minus in the process of repair, due for the most part to accidental conditions. A scar may be *weak*, showing a tendency to reopen on slight provocation, which would argue some feebleness in the reparative process. Such a condition must be met by a remedy indicated by the general condition. Probably in the absence of particular indications, *Calc carb.* oftener meets the emergency. Syphilis, scorbutis, and tuberculosis frequently cause the reopening of wounds long healed, or even the disunion of old fractures. *Mercurius*, lime juice, or some clearly indicated remedy must be relied upon to repair the damage. Very often the retention in the wound of some foreign material, as small splinters of bone, or fragments of gun-shot, will cause repeated openings of healed wounds. The indication is plain to remove such material if it can be reached.

A scar may be too *thick*, hypertrophic, and while otherwise well formed be an annoyance from its unsightliness, or may even impair usefulness. In cases of sufficient magnitude, such blemishes may be shaved off, dissected out, or subjected to systematic pressure by straps or elastic collodion. Up to the present I have not found any remedy to give satisfaction, or even to produce any effect whatever.

A scar may again be too *thin*, as it is called, the epithelial covering being delicate, and liable to be rubbed off, or abraded. Such cases have always promptly improved under *Oxalic acid* 30^x. When bluish in color, and likewise easily becoming excoriated, *Muriatic acid*, in the same attenuation has given good results.

There may be *deep attachments* of a cicatrix, to bone, fascia, or muscle that seriously impairs the utility of a part. In such cases *Silicea* will rarely fail to loosen them up.

A scar may be *depressed*, the contraction being too vigorous. Such cases have been improved by *Silicea* very notably.

Ulceration of a scar is due to some general constitutional defect, and must be met by some remedy indicated by the general condition. Perhaps *Mercurius* will be oftener called for than any other. There yet remain two marked defects in

cicatrizization, about which little is known beyond their clinical features; scarring from burns, and keloid.

Scarring from Burns, almost uniformly presents the most exaggerated tendency to contraction. When large surfaces are involved the greatest deformity occasionally is observed; large joints are dislocated by the contraction, near parts firmly united, and the like. The causes for this peculiar contractility have never been satisfactorily explained. Possibly, as some have surmised, the action of heat on parts adjacent to those actually burned may be responsible, but no explanation of these effects is obtainable. Therapeutically they are of interest to the operating surgeon, but the subject is not pertinent to the present work. In contractions of minor degree, tension and *Silicea* have given good results in a number of instances. The probabilities are that in the graver forms nothing but operative measures will be of any avail.

Keloid (otherwise *Cheloid*) is a growth that is sometimes found in scars, for some reason more commonly in the Negro race. They may be single, more often multiple, and so markedly of the tumor character that the further consideration of the subject must be postponed to the appropriate chapter.

We have now completed a rapid survey of the conditions necessary to be understood before taking up the subject of surgical pathology proper. The processes are more closely related to physiology than pathology, but derive their importance, to the surgeon, from the fact of their intimate relation to the latter as much through the possibility of becoming in themselves pathological as to their agency in repairing the results of morbid action.

VIII—INFLAMMATION

INFLAMMATION is a word of uncertain derivation, which has been used from the earliest periods as denotive of a condition of abnormal heat; in all languages, ancient and modern, some form of word has been used signifying "fire" or "flame." So, to-day, we understand it to express a condition of increased heat, waste of tissue, and pseudo-growth, secondary upon hyperæmia, and that sustains a relation to surgery similar to that of fever to medical practice; indeed, fever is an accompaniment of inflammation, but inflammation is not present in all cases of fever. Next to fever there is no process in the whole catalogue of morbid action that enters oftener into the semeiology of disease; it is found preceding, accompanying, or following every surgical affection, and in many ways plays such an important part in matters of prognosis and diagnosis, that its consideration is very properly placed at the very threshold of surgical study.

The limits of a work like that upon which we are now engaged, are altogether too restricted to treat a topic of this magnitude with any degree of thoroughness; at most we can only take up the salient features, and the results of experiment, referring those who desire minute analysis, and to draw their own conclusions from inductive studies, to the numerous systematic works, and the laboratory. Indeed, this is the province of the text-book, on matters of science, particularly when treating of topics falling more or less within the domain of the recognized specialties. It is impossible for the active practitioner to read and study all the conflicting theories of the day, weigh the relative value of experiments, and determine

the credibility of witnesses. Such work falls more properly within the province of the special student, whose opportunities, both of practice and reading, peculiarly fit him for the task.

Some of the more prominent symptoms of inflammation are common to hyperæmia, and formerly led to much confusion among pathologists; in fact the majority of our text-books to-day speak of "adhesive" inflammation, when active hyperæmia is meant. Inflammation is *always* pathological, destructive in the sense that structural modifications impair function. Hyperæmia, on the other hand, is oftener physiological, as it is an essential element in repair, and accompaniment of functional activity. There is still another reason why this term "adhesive inflammation" should be discarded. The products of inflammation, under ordinary conditions, pass away with the cessation of the process. A plastic exudation rarely undergoes permanent organization, as does scar-tissue.

The older pathologists taught that inflammation consisted in the establishment of four symptoms, or groups of symptoms, *viz.*, heat, pain, redness, and swelling. Their facilities for studying vital processes were too limited to enable them to correctly interpret even these cardinal symptoms, and they had no knowledge beyond them. Limiting the semeiology in this way, was the reason why no distinction was made between repair and waste. Even at this day, when the microscopist and chemist are throwing light into the dark corners of nature, making familiar as household words, many of the former "mysteries" of life, the student is often misled in the appreciation of what he sees. The symptoms of inflammation he often considers the process itself; the tumor is viewed as the concrete tangible disease. Now it must ever be borne in mind, that in all manifestations of morbid action, and perhaps the causes as well, we see only the results of the process, not the process itself. Thus inflammation is a chemico-pathological process; the symptoms by which it is recognized are not the inflammation, nor do they produce it. They are simple consequences of the disease, its expression, evidences of its establishment. We will consider inflammation under two heads:

the *acute* and the *chronic*, inasmuch as there are radical differences in the two forms.

ACUTE INFLAMMATION.

In studying this topic systematically, we must first consider diagnosis, which is largely dependent upon the four so-called "classical" symptoms; next the pathology and etiology; glancing, finally, at the special therapeutics.

Diagnosis:—One or more of the common symptoms of inflammation may, and do, exist in hyperæmia and irritation; to constitute true inflammation, however, *all* the symptoms must occur. As far as diagnosis is concerned, there is no single symptom that can be accepted as conclusive evidence; it requires all of them, but there may be much variation as to degree. From the earliest periods down to the present, diagnostic symptoms have been arranged in two groups, an objective, and a subjective, including four prominent conditions. The subjective are, heat and pain; the objective, redness and swelling. The terms, however, do not at all times represent the state of affairs in a given case, with the exception of heat, which is always present—the pain, redness and swelling being materially modified under certain conditions. We will consider each of these symptoms separately, commencing with the objective group.

Redness:—An inflamed part undergoes changes in color from various circumstances, which will be more particularly described when we come to speak of the pathology. The first of these is the increased amount of blood in the part. When the part is superficial, the change in color is more pronounced than when it is situated deeper. The exact shade of red will depend upon the texture of the part, the degree of tension in the vessels, the speed of the circulation, and the natural color of the tissues. When the parts are very near the surface, and the integumentary covering is thin and more or less transparent, the redness is pronounced. It is modified greatly by the vascularity of the part. For instance, in an inflamed cornea, where the vessels capable of carrying red blood termin-

ate just within the circumference, the more central parts of the tissue are cloudy and milky from the spaces being crowded with the plasma, with few, if any red blood-cells. Again, when the skin is unusually dark, as in the case of negroes, the redness is not apparent, but there is a greater intensity of color, a deeper shade. When the tension in the vessels is not extreme, and the current of the blood is swift, the redness will be bright; if the tension is considerable, and the velocity diminished, the tint is darker. In these many ways the shade of red is modified, but there are still other conditions that determine the color. Red is more pronounced in proportion as the part is naturally colorless or white. When the natural color of the part is other than white, the color resulting from the injection of an unusual amount of blood, will be a shade that would be produced by a mixture of red and the existing color; a blue iris, when inflamed, would not be red, but purple. Thus we find that the intensity or vividness of the red, will depend upon the degree of tension in the vessels, and the rapidity of the blood current, together with the transparency of the parts. When the parts inflamed are colored, redness will not be produced, but a shade determined by the color of the part. Therefore the equivalent for redness is *discoloration*.

The tension may be so extreme, that the vessels are ruptured. The blood is thereby poured out into the tissues, and the coloring matters may permanently stain them. With a high degree of tension, short of laceration, there will be such an exudation of serum in loose textures, that the intensity of the red color is lessened by a practical dilution. There are certain characters to the redness that are constant and diagnostic, however it is produced, and whatever modifications there may be. Thus the redness shades off into the surrounding tissues, not terminating abruptly, as is the case in erysipelas and extravasation. On pressure with the finger, forcing the blood out of the part pressed upon, it becomes white, the redness returning in a sort of wave when the pressure is removed. When there is an extravasation of blood, as from rupture of a vessel, the color is unchanged by pressure; there-

fore in cases of inflammation with such extravasation the application of pressure gives somewhat negative results. Fortunately, however, as far as diagnosis is concerned, redness is not the only symptom of inflammation.

Swelling:—With the exception of heat, the most interesting and complex of the symptoms of inflammation is unquestionably swelling. The causes are threefold, *viz.*, exudation, increase of blood in the part, and actual tissue-growth. That increased amount of blood in the part, from an actual increase of the contents of the affected territory—causes some degree of swelling, is self-evident; as one of the causes of swelling, it is of the least importance. Exudation is, perhaps the most important of these, occurring to a greater or less extent in every case of inflammation. The characters of the exudate depend entirely upon the degree of tension in the vessels. In normal degrees of tension there is no exudation. A slight increase, as would occur when larger quantities of blood are forced into a part than it can easily provide exit for, would give a serous exudate, a loss from the blood of the watery portion. With still greater tension, the exudate would be albuminous or fibrinous, giving false membranes, as in croup and diphtheria. The maximum tension, would induce rupture of the vessels, and consequent extravasation of the blood. As far as exudation is concerned in the production of swelling, the character of the part will determine its degree. Thus in loose textures, or those of an elastic or distensible character, the swelling will be extreme. When the inflammation occurs on a free surface, as the intestines or mucous passages, the swelling will be little, but the exudation will stand as an equivalent. In dense, inelastic tissues, as bone or cartilage, there will be increased density, with little increase in size. Hence we may say, there is swelling or *increased exudation*.

But exudation is not the only cause for swelling in inflammation; in fact it is questionable if it is even the chief cause. In all inflammatory exudates we find white blood-corpuscles, which, among other properties, stimulates “formed” or connective-tissue corpuscles into renewed activity, inducing in

them a return to embryonic conditions. There is thus an actual tissue growth of the inflamed part, but fortunately, not of a durable character; with the subsidence of the inflammation its products pass away, as a rule. In some instances a dyscrasia or diathesis will have the effect to perpetuate these products, tumors or plastic adhesions being the result.

Pain.—The causes of pain are not hard to find. Dr. ROBERTS BARTHOLOW says: "Several elements enter into the composition of pain—the peripheral irritation, the transmission of the impression to the centre, and its realization by consciousness." Thus we see, with an identical irritation, in two individuals, the degree of pain experienced will be proportionate to the receptivity, or acuteness of perception in each. The pain has less relation, therefore, to the kind or intensity of the irritant, than it has to the individual's capacity for feeling. Next will come the nervous supply of the part, the pain being greater in proportion as the part is more or less liberally supplied with sensory filaments. To some extent the function of a part will modify pain. In fact, in some instances, there may be no pain at all, simply perversion of function. Thus gastritis may be almost painless, vomiting becoming its equivalent. So in some forms of cystitis, "spirting of urine" will occur. It has been well said that pain is a simple excess of pleasure. For example, a warm fire is pleasant on a cold day; to increase the heat, as by placing the body in the flame, would cause pain. A sound, pleasant in itself, may be prolonged or increased in intensity until it becomes painful. A normal eye finds sun light grateful, but an intense glare of reflected light, or prolonged looking at the sun, may not only cause pain, but an actual structural lesion. We may thus consider pain to be the result of an unduly prolonged irritation, perhaps normal in character, or one of unusual intensity, its actual degree being determined by the sensibility of the individual. Later in the case, however, there are additional causes for pain. The increasing swelling or density, by compressing nerve filaments, causes pain. Later, the nerves themselves, partake in the inflammatory action, and an exudation from the neuro-

lemma occurs inwards, which causes compression of the axial matter. Should this compression become extreme, nerve conduction may be destroyed, and all pain cease. Hence the character of the tissue will very greatly modify the degree, and the kind of pain. In dense inelastic tissues the pain will be greater than in elastic or distensible ones. On free surfaces it may not amount to a pain at all, as in some forms of cuticular inflammation; it may be a mere smarting or stinging. We find, accordingly, that pain, as with redness and swelling, has an equivalent, *viz.*, *increased sensibility*.

Heat.—Heat cannot properly be placed in either the subjective or objective groups of symptoms entirely, for it is as much one as the other. The touch and the thermometer give us more accurate information as to the degree of heat than the sensations of the patient, and thus it might be more proper to consider the symptom more essentially objective. It would seem that heat was also particularly diagnostic of inflammation, inasmuch as it is a constant symptom, and one without an equivalent. Its importance as a symptom being so marked, it is to be regretted that there is so much uncertainty in regard to its origin. Surgical teachers are much divided on this subject, other considerations than those growing out of a study of physics requiring attention. Some consider the elevation of temperature to be due entirely to oxygenation; others to increased vital effort; still others to chemico-pathological changes; and a few that it is material, and gradually diffused throughout the body by material contagion.

The more prominent facts in the case are about as follows: immediately upon the establishment of inflammatory action, in the stage of "passive congestion," the local temperature will rise. The rise may be all the way from one to ten degrees (F.), the extent of the rise at once marking the intensity of the process, and warning of the danger that may obtain from a fall, which is often proportionate to the rise. Shortly the outgoing blood will be found much warmer than the incoming; next the blood in the affected member will be of higher temperature; soon the whole of that side of the

body partakes in the elevation, and finally the entire volume of blood is heated. Of course the passage of blood through an inflamed part will raise the temperature, and when the whole circulation becomes quickened, as always occurs in inflammation of any degree of intensity, it will require very little time to heat the whole volume of the blood. The question is therefore narrowed down to the cause of the increased heat in the beginning.

It is impossible to give even a summary of the numerous experiments that have been made to determine this point. I must rest content to give the results, as they appear to me, somewhat justified by own feeble attempts to solve what must remain a difficult problem.

As will be seen when we reach the pathology of inflammation, there are five physical states of much value in this connection.

First.—There will be an increased amount of blood in the part.

Second.—The rapidity of the current will be notably greater than normal.

Third.—Stasis is the culmination of the process, with a great accumulation of oxygen-carriers (the red blood-cells) at the focus of inflammation.

These three conditions indisputably furnish the conditions for oxygenation.

Fourth.—Wandering leucocytes are found in the tissues, which determine increased vital effort, also associated with tissue-waste in certain proportion.

Fifth.—There will be fever, with the characteristic excretion of urea, and other evidences of tissue-loss.

Now these are the chief of the established facts, and whether we call the result oxygenation, or what not, the facts remain, and serve to prove that organic elements are consumed, and the elevated temperature is due, as SIMON puts it, to a state of "active calorification" by material contagion. In support of this view, BRYANT (*Pract. of Surg.*, p. 28), quoting in part from MONTGOMERY, speaks as follows: "Either

continuously during the intensity of feverishness, or else more abruptly when feverishness begins to subside, there can commonly be traced in the excretion an excess, more or less considerable, of these nitrogenized, sulphurized and phosphorized products which emanate from textural and humoral waste. And that febrile excretions do, as a rule, undoubtedly attest increased devitalization of bodily material."

The constant symptoms of inflammation may now be tabulated as follows:

Pain, or increased sensibility.

Redness, or increased blood-supply.

Swelling, or increased secretion.

Heat always, without equivalent.

The above, however, are chiefly local, and rarely exist without constitutional or general disturbances, which are not at all surgical in character, being common to many forms of morbid action. They vary in different cases, as regards intensity, and perhaps, to some extent, in the order of their appearances, but for the most part appear as follows: When mucous surfaces, particularly from central causes, are affected, the first symptom will usually be an arrest of the natural secretions, with a feeling of dryness, both subjective and objective. A familiar example is the feeling of dryness and scraping in the throat on "taking cold." This sensation is due to many causes, most of them unexplainable; primarily there is capillary hyperæmia, which, for a time, arrests or prevents secretion. Later, there will be an exaggeration of the secretions, often not until resolution commences; the excretion being very abundant, at first mucous or muco-purulent, depending upon the intensity of the process, later becoming more albuminous and less purulent, as well as diminishing in quantity, as the morbid action subsides. In cases in which the inflammation is high, and the course is rapid, we find these three well marked stages; first suppression, second excitement, and lastly exhaustion. Upon the full establishment of the inflammation, fever will occur, its intensity

directly related to the intensity of the inflammation, readily traceable to the increased heat of the whole volume of the blood. The general symptoms, therefore, are not at all surgical in character, and need not detain us longer.

PATHOLOGY.

A study of the pathology of acute inflammation shows that the process is essentially a condition of exaggerated production, with deficient or arrested organization. These results are dependent upon changes in the blood-vessels, with disturbances of circulation growing out of them, together with alterations in the character and composition of the blood, not entirely related thereto. The changes in the blood-vessels are with reference to tonicity, size, and capacity. The changes in the circulation are temporary arrest, increased rapidity, and final stasis more or less complete. The changes in the blood are increased fibrin, increase of white corpuscles, and loss of fluid elements. That we may have a clear understanding of the causes operating to produce these changes, let us review the physiology of the blood. In the chapter on hyperæmia something was said on this topic, but we have now reached a point where the subject must be more carefully considered, as the exact line of demarcation between hyperæmia and inflammation must be sought.

The blood, as is well known, carries nutriment to the tissues through which it circulates, to some extent removes effete material, and acts as a functional stimulant to the parts it supplies. To fulfill these varied indications it must possess equally varied physical characteristics; it must possess fluidity, and carry in its current material from which tissue is formed, in whole or in part, as well as some stimulating principle. We find it, accordingly, composed of fluid, semi-solid, and solid constituents, each with distinct functions. The fluid portion is the serum, which acting as a vehicle for the others, carries, in addition, in a state of suspension, the saline elements, which are not discoverable until they are separated or precipitated therefrom. The semi-solid portions are the

albuminous elements, or fibrine, which have been variously considered tissue-forming, and excrementitious. SIMON and CALLENDER teach it represents post-perfection; that it is material which has outlived its tissue-forming destiny, and is either eliminated through the lymphatics or reconverted into plasma. In other words, it is the excess of plasma, the waste; that portion which is not needed for ordinary repair. We are familiar from our recent study of hyperæmia, with the fact that stasis or interruption of the current of the blood, will greatly increase its fibrinous character. But this fact may be accounted for in other ways than a supposed post-perfection.

The latest teaching does not sustain the assertion of SIMON and CALLENDER quoted above. Fibrine does not exist in the blood under normal conditions. A coagulable albuminoid element called fibrinogen is found, constituting about three per cent. of the plasma, which under certain conditions does become organized into the contracting filamentous substance which we call fibrine. The conditions determining this coagulation are variously estimated by different observers; some assume that the paraglobulin of the red cells, acts as a ferment, determining the coagulation or solidification of the fibrinogen; hence this substance is sometimes called "fibrinoplastin." It is essential to the process that there should be an arrest of the circulation in the part, such as occurs in inflammation, or some lesion of the coats of the vessels. It should be observed, before going further, that the quantity of fibrinogen is not uniform throughout the whole volume of the blood. It is, as CLELAND (*Animal Physiology*, p. 110) says: "not easy to determine the measure of its variation; but there is one circumstance which makes it seem probable that the fibrine is not used for the manufacture of tissue, but is a product resulting from the changes effected in the blood by circulating among the tissues; and that is, that the blood emerging from the liver, after being subjected to the action of that organ, is no longer spontaneously coagulable, and only yields a small amount of fibrine after violent whipping with rods (BECLARD)."

So far the evidence is in favor of the excrementitious char-

acter of fibrine, but evidence on the other side is abundant, and may be considered to represent later views, based upon more extended observation. DALTON (*Physiology*, p. 82) says: "If pure fibrinogen, in a dilute saline solution, be coagulated by heat, the quantity of coagulum so obtained is as great as that produced by coagulation by action of the ferment (FREDERICS). This shows that the spontaneous coagulation of fibrinogen in the blood does not depend upon its union with another substance, but that it is simply a change of molecular condition, like that which occurs in other coagulable substance." Next comes HAYEM, who finds that the granular bodies found in the blood, are destined to become red blood-cells, and he has given them the name of "hæmatoblasts," on this account. ANDRAL supposed them to be fibrine, and found them to have filaments added at the moment of coagulation. Finally RANVIER says: "These angular granulations which exist in the blood, are little masses of fibrine, and they become the centers of coagulation, as a crystal of sulphate of sodium placed in a solution of the same salt becomes the center of crystallization." The experiments of HAYEM go far to prove the proposition of RANVIER, as he has found the hæmatoblasts to be the foundation for coagulation as it occurs in spontaneous arrest of hæmorrhage from cut veins. This discussion is of interest to the surgical pathologist, inasmuch, as will appear later, a prime condition of inflammation is increased fibriniferousness of the blood. We have learned at least that heat and arrest of the circulation produce coagulation, and we must determine whether these conditions are furnished prior to the establishment of inflammation, or later. In other words, are they causes or effects? For the present we can pass to other considerations.

The solid portions of the blood are the red and white corpuscles. The former of these are assumed to be simple carriers of oxygen, but the mode of production, and final disposition, are still in dispute. Accepting the theory that they are chiefly concerned in carrying oxygen, we, as surgical pathologists, are not further interested in the controversy.

The white cell is variously spoken of as the leucocyte bioplast, lymphoid-corpuscle, etc., all expressing the same idea, that it is protoplasmic, an essential factor in formative processes. The origin, function, and destiny of this body are well understood, so that the study forms a very interesting chapter in vital processes. It is proper to enter upon this topic at this time, as preliminary to some later considerations.

Among the lower forms of organisms, the infusoria, we find one, of the most simple construction, purely protoplasmic, or bioplastic without demonstrable organs or parts; a homogeneous mass of albuminous matter. It has power of locomotion, by thrusting out portions of its substance, pseudo-poda ("false-feet"), and projecting the body into them. At times the movements are quite rapid, and cause constant changes in form when viewed under the microscope. This changeableness in form has led microscopists to name it the "amœba," from the Greek, signifying "change." Now as far as our means of observation extends, the white blood-cell is a veritable amœba, and moves about in the current of the blood, and in the tissues into which it finds its way, independently; it almost seems to be occupied in furtherance of design. Its peculiar function is two-fold, so far as it is of surgical interest, *viz.*, to stimulate growth and reproduction in cells, by conveying to them a stimulus perhaps not originating within itself; and possibly to form tissue, by duplication of itself, precisely as all cellular organization is carried on.

Now the white cells, or leucocytes, are born in the lymphatics and "blood-glands," leaving there with few elements of life in themselves, circulating in the blood as idle formative material, until they reach the lungs. They enter the lungs through the pulmonary artery, ordinary plastic matter; they emerge from them in the pulmonary vein, living bodies, capable of continuing their life and functions, under favorable circumstances, outside of the body. We shall have frequent occasion to study the manner in which they convey both normal and abnormal influences to other parts of the body, but at present are only concerned in two properties. First they

stimulate renewed growth and reduplication in formed cells, with which they come into contact, after leaving the blood-vessels. Second, they probably multiply themselves and form new tissue, becoming "formed" or "connective-tissue" cells, which, in the case of inflammation, is often as short-lived as the process is hyper-natural, this accounting for the pseudo-growth as a characteristic of the swelling. Later I shall have occasion to speak of the mode of transit of the leucocyte from the vessel; at present this is sufficient. The escape of the fluids into the tissues, through the walls of the vessel, salts, albumen, and red-corpuscles, is accomplished by forces entirely outside of themselves; that is, they escape by transudation, or extravasation due to intra-vascular tension from the crowding into the vessels of an unusual amount of blood. One of these elements escapes with greater ease than another, under different degrees of pressure, not from any vital peculiarity, but simply by their differing ability, in point of fluidity, form, or dimensions to pass through the walls of the vessel. In the case of the leucocyte, however, the escape is accomplished in a very different manner. This will be shown later.

This review of the composition of the blood includes only that which is of value or interest in the present connection. We must, with like brevity, recall some of the facts relating to the circulation of this "fluid-tissue."

When speaking of hyperæmia, it will be remembered, it was said that the circulation of the blood was carried on by the combined agencies of the heart's action the muscular contractility of the arteries, the pressure of surrounding muscles, and the action of gravity. Possibly capillary attraction may operate in some places. The normal action of each of these agencies secures a normal circulation; any excess of action in one direction, or lowering of vigor in another, must modify the whole function. The changes in the circulation, in the commencement of inflammation, are confined to a somewhat restricted territory, and may be abortive. At present, however, we are solely occupied with those which go beyond a mere hyperæmia. As to the vessels themselves, the primary

change observed is in capacity, either dilatation or constriction, beyond what is usual in ordinary conditions, both as to extent, and continuance. The dilatation of a vessel is wholly due to the tension from the blood forced into it; it is purely a passive act. The reactionary contraction is produced by the action of the middle or muscular tissue, its energy being derived from the vaso-motor system of nerves. There is very much confusion in our text-books as to the origin and distribution of these nerves. Some assign them a cerebro-spinal origin, and look for their roots in the medulla, and cervical spine. Others consider them ganglionic and suppose them to be in relation to the cardiac ganglia. Others again, esteem them to be derived from both systems, assuming them to be partly inhibitory, and partly excito-motor. DALTON (*Physiol.*, 1881, p. 104) says: "The real origin of the vaso-motor fibres of the sympathetic is in the spinal cord. All the sympathetic ganglia, besides their connection with each other by the longitudinal filament of the sympathetic nerve, are connected with the adjacent spinal nerves by communicating branches; and many of the fibres composing these branches may be traced through the spinal nerve roots, to the spinal cord. Furthermore, experiment also shows that the spinal cord is the source of nervous action for the sympathetic system." As to their double function there can be little doubt, and it is possible their double character extends to the point of origin. A recent writer (STRICKER) affirms that they are even in two distinct sets, a vaso-dilator, and a vaso-constrictor; if he is correct, which is not certain—this is the only occasion in animal physiology when a tubular organ dilates in any other manner than from a cessation of vital constriction, or an intra-tubular pressure from unusual injection. There is little doubt in my mind that dilatation, during normal circulation, is solely due to the entrance of blood into the vessels; contraction is produced by the contraction of the muscular coat, in part from the continued nervous stimulus though the vaso-motors, and in part from the irritation of the muscular fibres from the former distension; the resiliency

of the vessel, in other words. For some time I have been of the opinion, that if the muscular tissue of an artery represents a continuity of the muscular fibres of the heart, the vessels are inherently irritable in common with the heart. Lately some corroborative testimony has been furnished. The *New York Medical Times* (July, 1882, p. 121), in giving a report of the recent meeting of the American Institute of Homœopathy reports an abstract of a paper by Dr. WM. OWENS on "The Origin of Vaso-Motor Nerves," in which it is said: "On the other hand, the author of the paper then affirms that there must be another vaso-motor center" (than the medulla and portion of the cortex-cerebri), "and searches for it in the solar plexus or center of the sympathetic (organic) system of nerves. and quotes ROMLEY, VOLKMAN, SCHIFF, GOLTZ, MUELLER, MARSHALL-HALL, BIDDER, BURDEN-SANDERSON, ROSS and others. to sustain this opinion, and shows that all the functions of the circulation are under the control of this system of nerves, and that many of the organs may and do act independently of the brain, medulla or spinal cord, and refers to the lower orders of animals to sustain this showing, and that they have as perfect a circulation without a brain, medulla or spinal cord as the higher animals and man have with such organs." Every student is familiar with experiments made on the hearts of cats and frogs, showing how, when cut into a number of pieces, each will respond to irritation. This inherent automatic nervous energy, which exists at the centre of circulation, extends throughout the domain of the vascular system. Like other ganglionic arrangements the energy may be reinforced, here and there, but the original source is at the centre of its functional life.

The first symptom of approaching inflammation, pathologically, is a contraction or dilatation of the vessels, or system of vessels under observation. An irritant being applied to the surface, there is a tetanic spasmodic contraction of the muscular coat, leaving the fibres exhausted or momentarily paralyzed, which causes increased dilatation in two ways. First, by loss of tonicity the vessel becomes enlarged; second, by

ceasing to assist in the propulsion of the blood, a larger amount is admitted, and the tension is greatly increased. Should the irritant, however, expend its action on the centers, as might be the case in morbid action, the peripheral primary indication would be dilatation of the vessel from the loss of central nervous influence. So whether the primary lesion is central or peripheral, the enduring change in the vessels is an unusual dilatation. The vessels, after a time, may become enlarged in all directions, and the want of room in which to accommodate increased length causes them to assume a somewhat tortuous or spiral course.

The alteration in calibre, whether diminishing or increasing, has the effect to greatly impede the circulation in the vessels. When the calibre is lessened the barrier is a mechanical one, for the density of the blood is much greater than that of water, and the effect is not that which would be secured in narrowing the channel of a river. When the diameter is increased the flow is retarded, first from the loss of contractility in the vessel, and second, as growing out of that, the admission of a much greater volume of blood into the part, with no unusual facilities for its exit. The result is that the blood accumulates in the part, the flow becomes more and more embarrassed, and finally more or less complete stagnation occurs, constituting what is known as "stasis," or congestion. The increased tension, interior to the focus of inflammation, and the effort to find relief through inadequate channels of exit, have the effect to crowd the smaller vessels, giving an appearance of an increase in the number. These are the pathognomonic changes in the blood vessels, and the alterations in the circulation consequent thereupon. These conditions alone will not account for the inflammation; up to this point they are common features of extreme hyperæmia. We must now extend our inquiry, and consider the changes in the blood itself.

The first change in the blood is an increase of its fibriniferous character. As already said, it is not yet fully known whether this occurs before or after the establishment of the inflammation. It is certainly known that it occurs very early.

It is true that the change in the blood vessels and the diminished rapidity of the circulation would furnish the conditions for coagulation of fibrine, or even an increase in the hæmato-blasts in the affected territory. When the inflammation is from an unusually energetic irritant, or from a prolonged operation thereof, the alteration in the vessels would readily account for the fibrinous character of the blood. But when inflammation on the other hand, occurs from what would be considered an irritant of feeble energy, or a brief exposure to its influence, it would seem that there must be some predisposition, probably in the state of the blood. When we reach etiology we will find that there are recognizable states of the blood that are truly causative. The presumption, therefore, is that in some cases the state of the blood predisposes to inflammation, and in others the morbid action is responsible for the alteration in its character. The first class of cases may be held to be those in which the inflammation represents a veritable morbid action, with a tendency to later and secondary forms; the latter an accidental condition with a tendency to resolution.

It is not improbable that in some instances the albuminous and fibrinous elements of the blood may be in a relative excess from the loss of serum. We know that the slightest increase in vascular tension will give serous exudation, the albuminous elements not appearing in the exudate until the tension is very greatly increased. As a matter of fact in plethora, and some semi-pathological states, there may be a loss of serum materially raising the specific gravity of the blood.

Next to the increased coagulability, the most noteworthy change in the blood is in the number of the leucocytes. In the commencement of the process there is no notable change in this respect, but very soon they will appear in unusual numbers. In watching the circulation in the mesentery of the cat, or web of a frog's foot, the red cells are seen to move along with such rapidity that they can scarcely be distinguished; the appearance is that of a continuous red stream. The white cells, however, are not carried along in the current of the

stream, but move slowly on the margins, even stopping now and then, and again moving on. Soon a number will accumulate at some point, and commence to make their way, apparently, through the walls of the vessel. How is this exit made? BILLROTH (*Surg. Path.*, p. 63) says: "How do such numbers of them get into the blood, and whence do they come? There are different views as to the mode of escape of wandering cells through the walls of the vessels. My views are as follows: The first change that we see in inflamed tissues during life, is dilatation of the vessels; the immediate results of this are increased transudation, and collection of white blood-cells along the periphery of the vessels. Then the wall of the vessel is gradually softened by some unexplained chemical process that goes on in every inflammation, so that by their active movements the white blood-cells gradually enter, and finally pass through it. Hence, dilatation of the vessels, accumulation of white cells along the walls of the vessels, and softening of the walls, seem to me to be the requirements for extensive emigration of cells. COHNHEIM and SAMUEL have lately announced the same opinion. According to ARNOLD, not only red but white blood-cells escape from the walls of the vessels at points where the capillary vessels leave small openings (*Stigmata, stomata*)."

Undoubtedly these considerations have weight, yet there is something more than this. Some authors teach the escape is made by a fissure; others, that the vessel is torn, a process of traumatism. In opposition to all of this I must offer what can yet be called only a hypothesis.

We know that when we have traced the capillaries to their connection with, or continuation into, the venous radicals, we have not accounted for the passage of the blood plasma to the intercapillary tissue, other than by osmosis. We are further familiar with the fact, that for a long time certain tissues of the body were said to be non-vascular, because blood-vessels could not be traced into the tissue, but terminated on the periphery in capillary loops. The typical tissues of this class were the cornea of the eye, and cartilage. How these tissues were

nourished became an important question to solve, and physiologists and histologists bent all their energies to the task. They soon found that the blood-vessels were nourished by minute vaso-vasorum; that the HAVERSIAN systems of bone did not end in the lacunæ, but canaliculi, which again subdivided into still smaller channels, many of them too minute for demonstration. The cornea was found to be composed of multitudes of cells, with "lymph spaces" between them, so that in acute keratitis the whole cornea was found injected, giving it a reticulated appearance, red at the periphery, where the spaces were larger, white near the center where they were smaller. In cartilage similar histological conditions were found. What is the natural interpretation? I offer the following simply as presenting some elements of strong probability, and as possibly opening up a new field for study.

May there not be a system of lymph spaces in all tissues of the body, soft as well as hard, intermediate between the capillaries and the venous radicals? Let us see. In moderate inflammation, many minute vessels appear that were not visible before. Increase the intensity of the process, and the number is still farther increased, and so on until intra-vascular pressure is so extreme that the vessels give way, and the limit of injection reached. No man will pretend to say that the greatest number of injected vessels just prior to extravasation fixes the limit of their number. No, because the fact of new vessels proves that in a state of normal vascular tension these vessels do not carry red blood. They are in anatomical communication with the vessels that do carry red blood, and must have a physiological relation to them. The presumption almost amounts to a certainty that they carry the plasma. The red cells only convey oxygen, not taking any part in the forming of tissue apart from their stimulating function. The fact that the lymph fills the lymph spaces, and acts upon, and is itself acted upon by the blood, is well known; but the assumption I have offered, of a direct communication, by continuity, between at least *some* of the capillaries and these spaces, is the point at issue. The inflammation having subsided, when of a high

grade (which is but another term for high tension), often leaves pigmentation of the parts. May it not be that the pigmentation is caused by the imprisonment of red blood-cells in channels normally too small for them, when they return to their proper dimensions; imprisoned in channels in which they do not belong? My opinion is that when the leucocyte is supposed to be wandering "free in the tissues," it is really moving in these lymph spaces, and is properly not out of the circulation at all.

STRICKER (*Inter. Cyc. of Surg.*) asserts, in the most positive and uncompromising manner, that the leucocyte does not escape from the vessel, and consequently never becomes a "wandering cell." He attempts to show that the fundamental phenomena of inflammation is a return of formed cells, or what he terms "basis tissue," to an embryonic state, and that the rapid transformation of this "basis tissue" gives the appearance of amœboid motion in a single cell. It may seem presumptuous to deny the accuracy of the observations of one like STRICKER, yet it would be something akin to sycophancy to question the daily evidence of my own eye-sight upon no better warrant than unsupported statement, made by an active partizan, particularly when the mass of observers fully confirm the conclusions of his adversaries. I give his statement, therefore, for what it is worth, but in a systematic treatise cannot criticise it as would be allowable under other circumstances. At the same time I must express utter dissent, for two reasons: First, my own experience is opposed to it; and second, the experiments of COHNHEIM, which have been amply corroborated by hundreds of observers, have the weight of argument, experience, and probability in its favor. VIRCHOW, it is true, not writing in support of COHNHEIM, indeed writing before him, refers to the metamorphosis of "connective-tissue corpuscles" in inflamed parts, but does not attempt to fully describe the process. The doctrine of the escape of the leucocyte fitly supplements his teachings, and shows us how the disturbing force reaches the formed tissue. Hence the sum and substance of STRICKER's teaching is, to carry us

back twenty years in the development of pathology and wipe out all that has been learned in the interval.

One or two points yet demand consideration. Can we demonstrate that the "stigmata," so-called, are openings of vessels? and how the larger white blood-cell pass through channels too small for the red cells? These questions have been partially answered elsewhere, but perhaps a further attempt may not be amiss.

A study of small blood vessels will show that the branches are given off in such a manner that the openings are funnel-shaped, having the effect to make the inlet of the vessel much more capacious than the continuity of the tube. Now when the larger branches of the capillaries that carry red blood are under observation, there can be no misinterpretation of what we see; when the much smaller lymph canaliculi are reached, the funnel-shaped mouths may readily be mistaken for stomata, chiefly as the vessels leading therefrom are too minute to carry red blood, and consequently cannot be demonstrated. In a series of micro-photographs accompanying a report by Surg. J. J. WOODWARD, United States Army (*Histology of Minute Blood-Vessels*), several of the photographs, notably plate No. 5, show these funnel-shaped openings very beautifully, although the observer conceives them to be stomata. Occasionally in studying a developing artificial inflammation one after another of these openings are seen to become filled with blood, their character being then unmistakable. Some do not assume this character, and the presumption is that the maximum of tension has been reached. Here again it is proper to state that STRICKER (*loc. cit.*) is found in opposition. He asserts that the appearance of an increased number of vessels is due to an actual manufacture of new ones. Thus the capillaries being protoplasmic, portions shoot out, and when processes from opposite sides meet, the solid cylinder becomes tubular by a process of vacuolation, and a new vessel is formed. This is true to some extent, but there is good reason for holding the theory that the stomatas are the mouths of small vessels.

While on this point, I may add one more possible proof of the position taken. Take another diagram, found in almost any work on systematic surgery, that old picture of a rabbit's ear, with the vessels injected by inflammation. It will be at once observed that the "new vessels" run out to a fine point, and terminate in the tissues. Now we may enquire, which is the more probable, from our knowledge of the physiology of repair, that the permanent vessels *do* terminate in this manner? or that small vessels that do not normally carry red-blood, have become injected under the abnormal tension?

Secondly, we are to enquire how the white cells find room where the red cells cannot enter. The walls of the lymph spaces, and the soft yielding character of the tissues, permit as great distension as the vessels, or rather compression. The reinforcing fibres at the openings of these minute vessels, will oppose a barrier to a red-cell, which the leucocyte overcomes by a change in its own shape. The red-cell can only get out of the ordinary current of the blood by pressure. When migration ceases, on the subsidence of the process, the white-cell is disposed of in various ways, at all events does not remain there as a prisoner.

To return to our leucocyte in the vessel. We see it protrude its pseudo-pod, apparently into and through the wall of the vessel, gradually its body passes into it; soon it is on the other side, the outside of the vessel, and is said to be "free." in the tissues. This constitutes the distinctive feature of inflammation, *viz.*, the wandering leucocyte. Let us be careful that we do not misinterpret it, however. The leucocytes are free in the case of adhesive hyperæmia. What is the difference? Very much, both as to method and purpose.

As to method, it does not escape by any vital process, as in inflammation; it escapes with the other constituents of the blood in consequence of the wound. Furthermore, as to method, it does not go wandering in the tissues. It is not designed to stimulate permanent cells to renewed duplication, entirely, but is to duplicate itself and help make new tissue. It retains its ordinary spherical form; it shows few evidences

of life; it soon becomes granular and organizes into tissue as in primary segmentation.

Finally, the last change in the blood is when a state of arrest is reached, stasis, or what was formerly called "passive congestion." The extreme tension has now driven all the serum into the tissues; the outlets of the inflamed part cannot carry off the increased amount of blood; the white cells have to a considerable extent, escaped out of the vessels, and the red blood cells, are packed together, almost a dry mass damming up the canal, and arresting the flow of blood. This furnishes us with all the conditions of heat, fever, swelling and other cardinal symptoms; the immense amount of oxygen taken to the part by the red cells, the increased vascular tension, the exudation, and modifications of tissue growth are all accounted for. Further changes are now destructive or retrogressive. The flow must be reëstablished, and the congestion relieved, as in resolution; the tissues must die, as in ulceration, when molecular, or in mass from starvation, as in gangrene; the imprisoned blood must break down, and disintegrate as in pyæmia, septicæmia, or abscess; or the vessel become occluded, collateral circulation established; plastic formations, or some form of tumor result. These changes, and different forms of termination will receive attention in appropriate chapters.

This concludes a brief *résumé* of the facts of the pathology of inflammation, as far as they are comprehended to-day; if inefficient, as a complete treatise, the hope may be indulged that at least hints as to course of study have been given.

As far as semeiology and diagnosis are concerned we have now found inflammation to consist in the establishment or succession of fourteen states, that may be arranged as follows:

1. Modified Function, (a) primary suppression, (b) secondary hyper-secretion.
2. Redness, or its equivalent, discoloration.
3. Swelling, or its equivalent, exudation.
4. Pain, or its equivalent, exalted sensibility.
5. Heat in all cases.

6. Primary arterial contraction.
7. Secondary arterial dilatation.
8. Increase of fibrine in the blood.
9. Transudation of elements of the blood.
10. Increase of leucocytes.
11. Local stasis.
12. Migration of leucocytes.
13. Increased cellular activity.
14. Fever.

EXCITING CAUSES.

As is almost invariably the case in morbid processes, the causes of inflammation are naturally divisible into two groups, the *exciting* and the *predisposing*. In the present instance, however, notwithstanding the condition is eminently pathological, purely exciting causes have as important a place as the predisposing, owing to the possibility of severe and destructive inflammation occurring without the slightest predisposition thereto. These exciting causes may easily be summed up under four heads, and much difficulty will be experienced in sharply differentiating them from maintaining causes. Violence, morbid products, nervous alterations, and changes in the blood, are the commoner exciting causes.

Violence may be considered as of two kinds, mechanical and chemical, and yet there is a certain similarity. Under the first head would be included all agencies which cut, bruise, or otherwise injure tissues, without introducing any chemical or toxical material. As a rule grave lesions do not induce inflammation, under ordinary circumstances; those which *irritate* rather than produce extensive tissue-change or solution of continuity, are much more likely to be causative. The local irritation of a wound fulfills, it is true, the first indication for inflammation, *viz.*, peripheral irritation and vascular contraction; but the exudations in place of being into the tissues, as would be the case if there were no open wound, is on a free surface, and becomes reparative material. If the raw and sensitive surfaces are fretted or irritated by improper

dressings or want of care, inflammation may result. The rule holds good, that in the absence of some predisposition to alterations of the blood favorable to inflammation, it can scarcely occur from the conditions ordinarily present in a clean uncomplicated wound. Under circumstances in which exudation will be into the tissues, as a contusion, or a lacerated or punctured wound, the conditions of inflammation will be fulfilled, and such will be a common result. Even in such cases, however, as long as the individual is in good health, the chances are in favor of a resorption of the effusion, and a normal disposition of the devitalized tissue; traumatism induces inflammation when the result is productive of irritation; when there are suitable changes in the blood; or when the devitalized tissues are not normally disposed of.

The introduction of chemical agents may produce inflammation in many different ways. Thus the local effects may produce irritation and changes in the blood vessels favorable to such a condition. They may be of a character to cause tissue-death (and, as will be shown later, such foreign material may cause inflammation as a mechanical irritant), or by septic influence. Finally the poison may have a specific action on the blood. Thus any agent that would have the effect to increase the plasticity or "fibriniferousness" of the blood, would be a potent one in establishing conditions most favorable to inflammation.

Morbid Products, such as vesical stone, gallstones, gangrene, and the like, frequently act as excitants to inflammation. The same may be said of coagulæ of blood, and other normal elements of the body that are accidentally altered either in their relation to contiguous parts of the body as a whole, or in their physical characters or properties. Many of these products are themselves the result of inflammation, and after the attack that has produced them has subsided, a period of quiescence may intervene, after which a renewal of the inflammation occurs in obedience to the principle that "a part once inflamed more easily becomes inflamed afterwards." Thus cystitis may, and frequently does produce a ropy-pus that

becomes the nucleus for stone. The stone once formed is causative of renewed inflammation of the bladder. The *continuous* character of the inflammation, in these and analogous instances, would readily induce inflammation in parts not otherwise predisposed, and have the effect to very greatly increase its intensity and destructiveness. In some cases, again, an interesting question might be argued as to the secondary inflammation being a simple continuance of the primary one which induced the morbid action. Thus gangrene is one of the terminations of inflammation; the line of demarcation is not at the boundary of the inflammation. The inflammation in this instance is clearly not entirely due to the proximity of the dead tissue; it is largely a continuance of the primary inflammation.

Innervation.—Disturbances of nerve action may cause inflammation, or favor its production, in one of two ways. We have already learned that central irritation will induce vascular dilatation and stasis from suspension of nerve stimulus. Wounds, therefore, in which nerve trunks are severed will be followed by inflammation in consequence of the injury inflicted on the nerves. There is still another method, and one too little insisted on by modern writers. The section of sensory nerves, by depriving parts of protection from foreign irritants, exposes such parts to inflammation entirely apart from any consideration of the effect of such lesions on the blood-vessels. This is often seen in paralysis with anesthesia. Thus in paralysis of the bladder, cystitis has been set up from the retention and subsequent disorganization of urine. Proctitis has occurred in connection with paralysis of the rectum; conjunctivitis, with paralysis of the lids; inflammation of the lungs, when the pneumogastric has been divided, and many other instances. In case of paralysis, from idiopathic morbid action, such consequences are possible, and most observers can point to instances. In traumatic cases, however, such occurrences must be rare, or at least of doubtful significance, as the injury to the nerves is of itself sufficient to produce inflammation, without any reference to the entrance of foreign irritants.

Even in cases non-traumatic, such influences must be extremely slow in development, or almost innocuous, as sensory paralysis frequently secures abnormal tolerance of the part to irritation.

Changes in the Blood, either from some actual or relative excess or deficiency in the elements, or the introduction of an irritant, is a very frequent, exciting cause for inflammation. In the first class of cases we find that "poverty of the blood," a deficiency in the elements, furnishes a corresponding imperfect repair. Death of tissue being in excess of repair, there will be imperfect defecation, of the body. It is equally true in the opposite state, *viz.*, a relative or actual excess. Here there is more formative material than the body needs, or than can be carried off in the usual way. The result is a retention of putrefiable material, peculiarly predisposing to inflammation on slight provocation. Acute anæmia, as from accidental hæmorrhage; acute or traumatic ischæmia; similar states of plethora or hyperæmia are one and all possible exciting causes of inflammation from the imperfect nutrition consequent thereupon.

There may be, secondly, an accidental introduction of some specific irritant into the blood, such as venereal poison, snake venom, from rabies, as well as a chemical agent, as arsenic. Agents that would have the effect to cause an unusual plasticity of the blood, would in the nature of things furnish a very common condition essential to inflammation; there need be nothing specific in its nature, the mere increased coagulability would be amply sufficient. Other agents, specific or what might be called "chemical" in default of a better word — produce the conditions of inflammation in various ways; sometimes by retarding the current in the vessels, by vaso-motor disturbances; sometimes by some interference with the action of the heart; sometimes by a change in the blood from specific action in the elements, one or all; and possibly from a purely irritating property. In many instances the *kind* of poison introduced can be detected by the symptoms produced on organs or tissues for which it possesses affinity. Thus *Arsenic*

will oftener affect the gastro-intestinal tract; *Cantharis* the urinary, and so on.

This is a very brief outline of the exciting causes of inflammation, yet it may be found sufficiently comprehensive to include under one of the four heads nearly every imaginable excitant. Taken in connection with what has been said of diagnosis and pathology, there can be little difficulty in properly classifying the multitudinous causes under the proper head.

PREDISPOSING CAUSES.

The predisposition to inflammation includes such conditions as render one person more liable than another. These are influences of a devitalizing character, peculiar habitual states of waste and repair; the retention of putrefiable excretions; and the previous occurrence of inflammation.

Influences of Devitalizing Character play a very important part in inflammations, that are non-traumatic, from causes similar to alterations in the blood already noticed. Whenever the forces of life are lowered, it is evident that the demand for unusual repair, if met at all, must be in response to an unusual irritation; ordinary stimulus cannot do more than increase waste already too active. In such cases, if subjects of traumatism, there is often a failure in repair, and if it is attempted the process readily passes over into inflammation. Poverty, with its attendant innutrition, and unsanitary environment, furnishes the essential conditions in abundance. So also exposure to cold, extreme fatigue, or the exhaustion from long and serious illness. In all such cases waste is excessive, and repair taxed to the utmost to preserve even a very low standard of health; the slightest addition to the irritation or loss must inevitably result in inflammation. Paralysis, whether sensory or motor, is a case in point. In the one case we have the loss of protection from external irritants; in the other the dilatation of vessels from the loss of nerve stimulus, gives causes for predisposition to inflammation in abundance. A consideration of facts such as these, would warn the surgeon

against performing operations, unless emergent, when every care should be taken to improve the bodily condition of the patient in advance, if possible, or, if this is impossible, to meet danger promptly on its first appearance.

Habitual Abnormalities of Repair, such as syphilis, carcinoma, struma, scorbutis, tuberculosis, and similar chronic morbid action, are frequently responsible for inflammation on slight provocation. Notwithstanding the majority of such morbid states are constructive in character, yet the tissue laid down is always of a low vitality, and the organism in general much weakened from the constant drain on its resources, to say nothing of the misappropriation of material furnished. These new tissues are of such low vitality, and imperfect organization, that little is needed to set up retrograde metamorphosis, and disorganization. In all of them we have a state of continual overproduction, so much that there is a constant tendency to inflammation.

Retention of Putrefiable Substances, such as retention of urine in paralysis of the bladder, or faecal matter in chronic constipation, frequently result in inflammation, first from the local irritation produced, and secondly from the absorption of some of the products of decomposition. The "defecation of the body" as POLAND says "is nearly if not quite as important as its nutrition." When the enormous amount of excretion going on in a healthy body is considered, through the lungs, skin, urine, and intestinal tract, it becomes evident that the failure in any one of these emunctories must be very detrimental to the welfare of the organism, unless some compensation can be found. As one of the earliest predisponents to inflammation is alteration in the blood, either increasing its plasticity, diminishing its circulation, or impoverishing it in some way, the habitual failure in excretion must sooner or later lead to such changes in the blood in general, that, joined to the local irritation, will be exceedingly favorable to inflammation.

Finally we should remember that a part once having been inflamed, readily takes on the same action again, and each

attack increases this facility. Why this is so is not readily explained; the fact is apparent. I have thought it might be done this way: A distinguished physiologist has said, that force in the organized body has a double purpose; to repel assaults of a disturbing character, and to maintain functional integrity under normal conditions. This force may be represented as existing in definite proportions from the beginning of life in the individual, and when any of it is lost, through the exigencies of accident or disease, it is a permanent loss, and can never be repaired. It is a special deposit, that bears no interest, and may be drawn upon as long as any of the principal remains, and no longer. Every draft drawn upon this veritable *corps de reserve*, weakens future powers of resistance, and a ready explanation is found for the greater susceptibility of those who have once been ill to subsequent morbid impressions.

It is evident that the distinction between exciting and predisposing causes cannot at all times be sharply drawn; the very conditions of the blood and innervation that predispose to such a morbid action are often and necessarily directly causative. There is one fact, however, that stands out very prominently, namely, that mere traumatism does not fill all the causative conditions; there must be an unexplainable change in the blood that converts a reparative and physiological hyperæmia, into an active inflammation.

Prognosis considered with reference to continuance of life, is dependent upon the extent and intensity of the inflammation, the tissues or part invaded, and the previous bodily condition of the individual. Thus a double pneumonia is more serious than a circumscribed lobular one; morbid action in the heart, is far more serious than a merely cuticular affection; should the individual be in poor health, particularly if suffering from some cachexia or dyscrasia, the effects of inflammatory action, both local and general, must be greater than when other conditions obtain.

As to preservation of function, similar questions are to be considered. The intensity of the inflammation, equivalent to

the degree of tension, determines the kind of exudate. Thus should the exudate be chiefly serous, resorption without enduring tissue-change must be the result. Should it be albuminous, or, in other words, should there be a large proportion of leucocytes, and the process active (acute), supuration is imminent, with some destruction of tissue as a consequence. Should the exudate be fibrinous, adhesion of contiguous parts is to be feared, sometimes lasting through life. Such adhesions may easily cripple the utility of parts, or cause pain from the inclusion of nerve filaments. In short, no matter what the question of immediate interest in prognosis may be, the answer will depend entirely upon the character of the tissues involved, the intensity of the inflammation, and the bodily state of the individual, modified or governed by the knowledge of the observer as far as the accuracy of the "foretelling" is concerned. In addition to what has been noted above, the surgeon will often be required to prophesy the *form* of termination, in fact it will be essential for him to know, from the symptoms in a given case, whether the morbid action is to be succeeded by other forms. This can often be determined by the activity and rapidity of the process, the bodily state of the patient, the degree and duration of stasis, the character of the exudation, and the general environment of the individual. The classical terminations, some of which will form the subject for special chapters—are as follows:

Resolution, in which the effusion is resorbed, the circulation reëstablished, and health restored with no notable or pronounced change succeeding, in either structure or function.

Suppuration, in which pus is formed, either terminating the attack, or changing its character.

Ulceration, in which the tissues suffer a granular death, and an open sore results.

Gangrene, in which the affected parts die in mass, from arrested nutrition.

Neoplastic Growths, from chronic, or sub-acute inflammation.

Besides these different forms or modes of termination, there are a number of complications, which have a certain relation to inflammation, and will need attention in separate chapters. They are, in order of importance, and possible frequency also—*Erythema*, a more or less evanescent cuticular inflammation; *Erysipelas*, a contagious and virulent metamorphosis; *Septicæmia* from the absorption of putrified organic material; and *Pyæmia* a form of toxæmia characterized by multiple abscesses and typhoid conditions.

Prognosis, however, has to do with still another question, relating to results depending particularly on the kind of tissue affected. When a tissue of somewhat loose texture is inflamed, resolution is generally perfect; occasionally, particularly when fibrinous exudation occurs, there is a resulting agglutination of fibres, and more or less permanent loss of function. The same result is often observed when tendons are implicated. Not only do we find tendons as a whole adherent to the sheath, but each fibre similarly attached; probably many deformities of joints, and so-called “contractures” are produced in this way. Many serous surfaces are thickened, or contract adhesions to near parts, as occurs in peritonitis, pleuritis, pericarditis, and so on. When the inflammation attacks glandular structures, organs that are actively engaged in production or elimination, an enduring hypertrophy, or hyperplasia is often the result; if this should involve a considerable portion, there may be a total loss to the organism, whether destructive or constructive depending upon circumstances. Thus inflammation of a kidney may result in atrophy, or in hypertrophy with cystic degeneration; in the one case there will be such extreme tension and perfect stasis, that the nutrition is entirely destroyed, and urine ceases to be eliminated through the glomeruli, resulting in atrophic changes, should the inflammation last some time. In other cases, perhaps of less intensity, some tubules become obliterated, urine accumulates, and hydronephrosis, with cystic degeneration of the whole organ. In other cases pyonephrosis directly succeeds the inflammation. In the spleen, liver and other glandu-

lar organs, the hyper-nutrition set up by the inflammation determines a hypertrophy that once established goes on indefinitely.

The vascularity of a part also determines the result. Thus in the cornea, cartilages, and similar structures, intense inflammation arrests nutrition, and necrotic processes ensue. If the parts are dense, and inelastic, as a bone, the imprisoned exudation arrests nutrition by compression of vessels produced by the increased density. This gives us granular disintegration, as in *caries*, or death and detachment of masses, as in *necrosis*. In cases of this character, while death of tissues or elements is going on in the one place, there is an ill regulated attempt at repair on the periphery, which has the effect to circumscribe the dead tissues, and also to imprison them by growing over, and thus the devitalized parts remain as a constant irritant, and establish a chronic inflammation, which may be considered a new form of morbid action.

Therapeutics.—In the treatment of acute inflammation hygiene often claims prominent attention. Should the nutrition of the body be deficient, it should be improved; if opposite conditions obtain, it should be diminished. In other words the surroundings of the patient should be of a character to favor recovery, as to temperature, light, dryness or moisture of the atmosphere, and the removal of any factors that may be directly causative. So also with the part; it should be in a position, elevated or dependent, as would tend to equalize the circulation, even, in some cases, to the extent of employing moderate elastic pressure and support.

Adjuvants, in the way of topical applications, are often of value. Elastic pressure would fall under this head, and is of utility sometimes in promoting or hastening absorption. The most generally useful procedures, under this head, are hot or cold applications. Heat is much to be preferred to cold, for obvious reasons: When heat is applied to a part the first, or primary effect, is to increase dilatation of the vessels: the reactionary effect, however, is to cause contraction, and this secondary effect is far more durable. When cold is used, the

conditions are reversed; we have a primary contraction, and a secondary dilatation. Heat will have the effect to reduce the blood supply and thus inaugurate, in many cases, resolution. The better practice, in ordinary cases, is to dispense with all topical treatment, as it is often a practical repetition of the irritation; at times, nevertheless, it may be useful to resort to it.

Remedies will at all times give the best results, more prompt in action, and more durable. There are few remedies in the *Materia Medica* that are without some relation to inflammation. Those more generally useful, types of a class, are perhaps as follows:

Aconite, when the case is acute, particularly in the earliest stage, that of suppression of excretion, the parts feeling hot, dry, and stiff. The patient is anxious, restless, and intolerant of heat.

Apis mel. In inflammation of subcutaneous parts, the exudate largely serous, œdema prominent, with pale, puffy swelling, and biting-stinging pains. Particularly indicated where the face is involved; fever, without thirst, and scanty or suppressed urine.

Arsenic. There is also œdema, but more extensive, almost anasarca, with dry, hot, burning skin, intense thirst, and great prostration with restlessness.

Belladonna. Intense inflammation, with hot, red, shining skin (radiating), and pungent heat, which seems to radiate from the part. Pains are severe and pulsative, worse from a light touch, but better from firm pressure.

Cantharis. Cuticular inflammations, superficial, with vesicular surface; colorless exudation forming white crusts or scales. Pains are smarting and excoriating.

Rhus tox. Also vesicular, but extending deeper, with rheumatoid pains, better from motion. The vesicles contain a yellow fluid, which dries up into yellow crusts, or leaves raw and sore excoriations.

CHRONIC INFLAMMATION.

Cases are occasionally presented to the surgeon in which long continued enlargement of glands, prolonged suppuration,

or some condition which might represent a sequelæ of inflammation exists, but which has no such history, the symptoms commencing insidiously, being unaccompanied by pain, and often with little if any disturbance of the general health. Notwithstanding there is an almost entire absence of the ordinary symptoms, prodromal and otherwise, of inflammation, yet the state is one of that character, modified by circumstances about which little is known. What has already been written about acute inflammation will be a proper introduction to a brief study of the differences characteristic of the chronic form, and following so closely it will be unnecessary to allude to more than the constant variations in causes, pathology, and results. It is possible to fill a volume with this subject, inasmuch, however, as the process is very imperfectly understood, being to-day involved in obscurity equal to that relating to acute inflammation ten years past, a work that claims nothing higher than the position of an elementary treatise, can well afford to content itself with a simple narration of facts, leaving argument on their significance to more pretentious works, or until future study and experiment shall make clear what is now well-nigh incomprehensible.

Whilst heat, redness, pain, swelling, and transient cellular activity are the constant and distinguishing features of acute inflammation, we find permanent structural changes of old, and a laying down of new tissues, the characteristic elements of the chronic form. Whether we study the genesis of tumors, of tubercle, of that protean disease scrofulosis, elephantiasis, and many other forms of morbid action, we find, in all alike, this peculiar form of inflammation lying at the beginning, and accompanying them in their development. Again, whilst most cases of chronic inflammation originate in an acute attack, very many *commence* in the chronic form, and without any of the ordinary symptoms of inflammation. The mere enumeration of these fundamental facts will serve to give an idea of the nature of the problems the surgical pathologist has presented to him; many of them, in the present state of the science, are utterly incapable of solution, even approximately.

As to anatomical and pathological characters, it may be stated that heat, redness, pain and swelling are frequently wanting entirely, or so greatly modified that, taken singly, there is scarcely a feature of inflammation present as given in earlier paragraphs. The vessels are enlarged, both in calibre and in length; their coats are thicker, particularly the outer, or, when not so, very greatly altered in character; the tissues of the part are swollen, either in a state of hypertrophy, in which there is an actual increase in the size or density of the parts, or the cellular elements are excessive, as in hyperplasia. The course of the process is slow, occupying, weeks, months or years, and the termination indefinite. At times there is a remittency in the symptoms with periods of indefinite duration, in which all local symptoms pass away. Familiar examples are seen in naso-pharyngeal catarrh, chronic gastritis, swelling of lymphatic glands, and many forms of otorrhœa. A brief consideration of the ostensible causes may assist the student in comprehending the pathology, and, perhaps, suggest a line of study, that may, if pursued, lead to an elucidation of the many vexed problems.

Most writers are agreed that the exciting, and some say the maintaining cause of chronic inflammation, is a continued local irritation. This has always seemed an utterly inadequate explanation, taken without any qualification. We know that in the case of a healthy individual, a prolonged irritation will lead to active inflammation, terminating in a natural sequelæ, more or less destructive in proportion to the kind, degree, and duration of the irritation. True, if the irritating medium cannot be disposed of, and suppuration or ulceration become profuse or extreme, the general health will suffer, the vital powers will flag, and the inflammation become chronic. This fact, gives a key to the true explanation, *viz.*, chronic inflammation is due to prolonged irritation, *plus* a disordered nutrition. Many such cases are met, commencing with some malnutrition due to occupation; as pelvic inflammatory states, inaugurated by hypermæia from sedentary habits, or long-repressed stool, or excessive sexual irritation. We find at the bottom

of such conditions, however, that there is what is popularly called a dyscrasia, or diathesis, either originating in the individual, or transmitted to him from his parents. These two words may be used indifferently, in the one case meaning "disposition to," and in the other a "bad habit." Rheumatism, arthritis, struma, tuberculosis, carcinoma, syphilis, and other conditions, are either transmitted to offspring by a survival of a peculiar disposition to the parent malady, and an unusual receptivity from deficient vital energy, or the diseased state may be transmitted in full operation. In either case, however, there is a manifest fault, plus or minus, in the formative sphere; an aberration of energy which can only be recognized by its manifestations, structural lesions being absent entirely, or existing only as effects of the morbid action.

As with syphilis, and probably with all the dyscrasia, when matters of inheritance, the formative elements are first impressed, and soon, by transmission from cell to cell, the whole organism becomes infected, and local structural changes take place. In many cases of chronic inflammation, however, there is probably a simple defect in nutrition, some disorderly assimilation.

There are some peculiarities in termination, some of which will receive attention later; the most notable are peculiar forms of suppuration. At one time calcareous concretions will form; at others amyloid or gelatinous deposits. Again the pus will become inspissated into a cheesy or lardaceous mass, or become liquefied and remain in cavities for a long time without undergoing further changes.

The treatment must be eminently "constitutional," as it is called, and will require remedies of the so-called "anti-psoric" group; remedies that have a long duration of action, as *Anti C.*, *Baryta C.*, *Calc.*, *Ferr.*, *Lach.*, *Lycop.*, *Merc.*, in all its forms, *Phos.*, *Scp.*, *Sil.*, *Sulph.*, *Thuja.* or *Zinc*, are particularly prominent. Beyond most of the fundamental conditions brought to the surgeon for treatment, none demand a more careful study of the "totality" than chronic inflammations; to give with any success an idea of the usefulness of any of these

remedies, would require a transfer of the entire pathogenesis, and cannot, as a matter of course, be given here. When we reach special forms of the condition, such characteristic features as are of practical value will be given, but it would serve no good purpose here, and would only render frequent repetition necessary. I may observe, however, that *Anti C.*, *Calc.*, *Baryt.* and *Sulphur* are oftener useful in the primary inflammation, without reference to the sequelæ, than others, at least in my experience.

Antimonium Crud.:—When cuticular surfaces are involved, the parts are hard, shining and glazed; not specially painful, but often the seat of a fine pricking or stinging. Cold water often relieves.

Calcareæ Carb.:—The parts are white, puffy and doughy; no pain, no tenderness, and local symptoms few and unimportant.

Baryta Carb.:—Chiefly glandular irritations, progressing slowly, frequently repeated, with a tendency to the formation of calculi in the follicles. Chiefly of service in old people.

Sulphur:—Somewhat similar to *Anti C.*, but the skin is rougher; water is unpleasant, whether hot or cold, but particularly the last.

IX.—SUPPURATION

Suppuration is the process resulting in the formation of pus, and may be considered both from a pathological and a physiological point of view. It is pathological when a product or sequel to inflammation, as it is eminently destructive. It is physiological when occurring as an element of repair, being conservative, and an essential factor in the process. It would be supposed, admitting the above to be a statement of fact, that there would be material points of difference in pus occurring under these circumstances, and such is the case. At this time it will be sufficient to state that in the one case the pus is what is known as "laudable," composed of two elements, the corpuscle and the liquor puris; in the other, the pathological form, there is an admixture of *debris* from the tissues, blood, and some notable modification in some of the proper elements. Whatever may be said of the connection of suppuration, of a pathological form, with the streptococcus, the question does not enter into the discussion of the physiological form. Unquestionably bacteria *are* found in pus accompanying repair, but there is no evidence, satisfactory to me, that they are in any sense causative of the process, or even that they have any relationship to it whatever. There is much evidence at hand, on the contrary, that, even in pathological forms, the micro-organisms are, at least, not constantly causative, in fact they may be entirely without significance.

Purulent Secretion.—Pus occurring on a free surface, in connection with repair, is known as a *purulent secretion*, and may be studied as the standard of pure or "laudable" pus. It is a semi-fluid substance, varying in specific gravity from 1.021

to 1.040, of about the consistency of cream, yellow in color, inodorous, tasteless, and unirritating. It is readily divisible into two elements, a fluid and a solid; the former is to all intents and purposes serum, and as such a simple vehicle; the latter is the pus corpuscle, presumably the leucocyte that has outlived its usefulness. In other words, pure pus stands as the excess of reparative material. Nature always furnishes material of any kind in lavish abundance, far beyond the necessities of the case. Only a small number of the millions of seeds of plants floating in the air ever become fertilized, or becoming so, reach maturity. An insignificant number of mammalian ova ever become fecundated and mature. The same prodigality is observable in all nature's operations. In repair, as we have seen in an earlier chapter, all the injured tissues, the blood and the lymphatics furnish germinal elements to build up the new tissue. A comparatively small number are thus utilized; the greater number are superfluous, as far as building up the tissue is concerned, but not by any manner of means useless as to the process as a whole. The leucocytes, using the term in the widest sense, and including the white blood-cell as an emigrant, the same body in the blood current, and the lymphoid cell, becomes the pus cell after death. That is, the true pus cell is a dead leucocyte, and one that has undergone fatty degeneration. Even as a dead body, the leucocyte has a function, namely to feed the growing cells. Indeed they have another function, also, to protect the forming tissue from outside irritants. While living, there is little question, the phagocytic property of the leucocyte is active, and many a micro-organism is met and disposed of that might prejudice repair otherwise. The functions of pus, therefore, may be summed up as protective and nutritive. It should be understood, however, that pus can only be looked upon as a true element of repair when occurring in open wounds, those that heal by granulation, or "second-intention." Occurring in wounds that have been approximated, and in accurate coaptation, it will probably have pathological significance. Even here, however, it may stand as a sort of exaggerated physiological

effort, being often produced by an attempt at repair, too energetic for the occasion, and as to composition being undistinguishable from "laudable" pus. In general, it may be concisely described as a process of luxuriation, and differs from inflammation and tumors in the following particulars: Inflammation is a state of overproduction, with an abortive attempt at organization. Tumors are a product of the same overproduction, with a more enduring organization. Suppuration is a still more energetic production, with no attempt, or the very feeblest, at organization.

A microscopic study of "laudable" pus shows the cells in various stages; some living leucocytes, actively amœbic; others quiescent, but otherwise unchanged; others fatty, granular, and dead; others, now and then, broken up, and some of their particles, perhaps, seen in the interior of the proper tissue-forming cells. Of course none have probably seen a single cell go through all these various changes; but none can study a drop of pus, and fail to be convinced that each pus-cell started as a living leucocyte.

The prognostic fact of value in this connection, is that the progress of repair can be determined by the quality of the pus. Thus when deficient, repair is feeble; when suppressed, repair is arrested, and some destructive morbid action threatens, as erysipelas, septicæmia, pyæmia, or the like. Should it become thin and ichorous, some destructive process is at work, ulceration or gangrene; if offensive odor is developed, there is similar probability. Should it become serous, repair is feeble. As long as it remains of normal character, all is going well; if it becomes changed, we give remedies to restore the normal character.

Arsenicum, the pus is thin, brown, corroding, and bloody, with other evidences of disintegration.

Belladonna, thick, yellow pus, not as fluid as normal, streaked with blood; high inflammation accompanying.

Calcarea carb., pus thin, milky, curdled looking; or it is watery, without color, or odor, with small whitish lumps. Sometimes it is putrid-smelling, particularly when curdy.

Calendula, when the pus is very profuse, but laudable.

Graphites, pus thin, viscid, scanty, smelling like herring-brine.

Hepar sulph. Scanty, bloody, corroding, smelling like old cheese. This remedy has a powerful effect in promoting suppuration.

Iodine, enormous quantities of pus, laudable, but oftener too fluid. The excessive waste does not seem to have any ill effect on the patient.

Lycopodium, very like the *Calcarea* pus, in general appearance, but is filled with "bubbles of air."

Pulsatilla, copious pus, thick, bland, and of a greenish color; sometimes viscid.

Silicea, brown, watery, slightly albuminous, gritty on rubbing between the fingers; putrid odor.

Sulphur, rather scanty, thin, putrid, of dark-brown, almost black color.

ABSCESS.

An abscess is a collection of pus in a cavity, whether natural or artificial, usually, if not always the result of inflammation. It is an eminently pathological process, and the pus presents characters that are very different from those of a purulent secretion. The fact that the pus is of such different characters goes for something in giving the process a different significance, but there are not wanting others, of even greater importance. It is true that suppuration of pathological type is typically expressed in the abscess, but it is sometimes found under other circumstances, on a free surface, or in connection with wounds. We have no term to express this condition; abscess is only partially applicable. While the facts would seem to warrant considering suppuration as of two varieties, physiological and pathological, yet there is far from being a general acceptance, one that would justify such a classification.

The first question to command attention is, what is the cause for the difference in suppuration? Why should one variety be an element, and an essential one—in repair, and

the other so eminently destructive. I admit that the majority of students and observers do not concede any such state of facts. The popular teaching is that *all* suppuration is pathological and undesirable. Still I am of the opinion that the facts are as stated, and an answer to the questions propounded not hard to find.

We may divide all abscesses into two groups, the *acute* and the *chronic*; these again are divisible into two, the *encysted* and the *diffused*. The first classification has reference to course and natural history, the latter to conditions of development.

Acute Encysted Abscess is the typical form, all others being modifications in one way or another. The natural history of this form is somewhat as follows: During the course of inflammation, or shortly after its subsidence, there will be a rigor, with some rise of temperature, pain or tenderness on pressure over a small spot, followed by swelling, and in superficial regions, or those open to inspection, more or less redness. The swelling rapidly increases, as does also the pain, with corresponding intensity in color; later one point is seen to be more projecting, becomes decolorized, or changed in color, is softer, and soon gives way giving exit to the contents of the abscess, or pus. This pus is at once seen to be something different from the purulent secretion, being mixed with more or less blood, tissue-*debris*, and some variety of streptococcus in the majority of instances. I say in the "majority of instances," for the reason that there are cases in which they are not found. Sometime after evacuation, varying from one to four or five days, the so-called "core" is expelled, after which all symptoms subside, and repair goes on in an orderly manner if not interfered with. Now here is a pathological condition, as unmistakably so as the purulent secretion is physiological. Possibly a micro-organism may be causative, but I am not in possession of sufficient evidence to accept such teaching; as a matter of fact such evidence as I have goes to prove the contrary, and to show that such an agency is unnecessary, the whole process being perfectly explainable

without taking it into account. Let us see what the process is, and how the above symptoms may be explained.

It has been stated in another place, that when inflammation ceases, the products disappear in due time. When, however, the attack has been of great intensity, with extensive tissue changes, and exudation of higher grade than serum, the products are removed, if at all, only after a considerable interval, and quite imperfectly in many instances. If the products should undergo disintegration, and thus become more or less septic, either abscess or septicæmia will result according to controlling circumstances. That is, if the products are taken up by the absorbents, while in this decomposing condition, septic infection must occur. If they are not thus taken up, they set up a renewal of the inflammation, which the state of the parts localizes, the tissues being agglutinated, and the secondary processes are, in a measure, shut off from neighboring parts.

At other times, it is possible, the migrating leucocytes undergo reproductive changes in their new locality, and excite such a stimulation in the formed tissue that there is an immense production of living cells in a small space, which by their mere bulk, as a mass, induce consolidation of the tissues surrounding them, which later becomes inflamed and converted into a limiting wall.

Again, cogulæ will form, from extravasated blood, or "fibrinous concretions" result from changes in the exudate; or calcareous concretions from causes yet to be considered, and the irritation set up thereby will soon induce inflammation, isolated by the adventitious capsule thus formed, and a limiting membrane is constructed.

No matter which of these conditions exists, the result is the same as to the formation of a limiting membrane or tissue, and one that is capable of active cellular proliferation, the proliferation being inwards, very largely, on the side of the cavity thus formed. This limiting membrane, or wall, has long been known as the "pyogenic" membrane, from the ancient conception that it was the source of the pus. To

some extent this is true, but it is far from being the sole source. The pyogenic membrane being once formed, the abscess has had a beginning, and now goes on to completion in a certain orderly manner. The organization of the pyogenic lining is weak and unstable, but outside of it a new one is constantly forming as long as the process continues. The most rapid growth of the abscess is towards the point of least resistance, which is ordinarily to the nearest surface, but fascia, or other dense tissues may determine a growth in another direction. As it approaches the surface the parts covering it become thinned by pressure and distension, the blood vessels also obliterated, and soon "pointing" occurs. The complete devitalization of the integumentary covering later results in its giving way, and the abscess is evacuated. Soon after the pyogenic membrane becomes detached, it is thrown out as a "core," and the cavity left is filled, as in ordinary repair, normal suppuration continuing as a feature. Now the growth of the abscess is due to constant additions to its contents, these additions coming from various sources. There is a proliferation from the pyogenic membrane; a possible segmentative augmentation of the leucocytes; an addition of serum from the increased vascular tension; the addition of particles from the disintegrating pyogenic membrane, which is constantly renewed by organization outside; some blood is probably extravasated, and probably a deposit of salts from the serum. All this combines to render the elements of this pathological pus, as it may be called, something very different from that of a purulent secretion.

It will be noticed that there is an area of induration, of variable extent, outside of the abscess. This is due to inflammatory exudation, which becomes organized into pyogenic membrane as the earlier constructions break down, the organization of the membrane in this successive manner having the effect to keep up the irritation essential for the maintenance of the inflammation. When the abscess is discharged this irritation is rapidly lessened, and when the "core" is expelled, the induration speedily subsides, but does not entirely pass away until repair is completed.

This is the history of the typical encysted abscess, a popular example being the common boil. But there are cases where no limiting membrane forms, and the abscess becomes as we say "*diffused*." What is the reason for this? The failure to organize a pyogenic lining is due to various modifications of the ordinary process. The inflammation may be of great intensity, and rapid progress, as in erysipelas, for instance, and time for organization may not be permitted. On the other hand the process may be feeble, and material for organization may not be furnished. In still other cases the inflammation may be of some specific character, or of a peculiarly destructive nature. When, from either of the above, a pyogenic membrane fails to be organized, the pus will follow in directions of least resistance, as in muscular inter-spaces, or in the loose subcutaneous connective-tissue, until it meets some barrier it cannot easily pass, when it will either find some new route, or "point" at the place where arrested.

Chronic Abscess is a condition that bears the same relation to chronic inflammation, that the acute form does to acute inflammation. It is a result of chronic inflammation, oftener occurring in the glands, and in those of a scrofulous or tubercular diathesis. The semeiology is altogether different from the acute variety, and the composition and general characters of the contents very unlike. The process may occur in any part of the body, or in any structure, but is more frequently observed in the bones, and the glands of the neck. Perhaps the dorsal vertebræ are oftener affected than other bones. The prodromal symptoms are very obscure, and the commencement, as far as objectivity is concerned, very insidious. In some cases there is a long period of ill health, with anæmic symptoms predominant, and in others there will be no such history. Once established the symptoms are negative, until considerable swelling occurs, and even then there is little observable beyond a slowly increasing swelling, with no pain, or very little—no heat, no redness, and none of the symptoms usually associated with abscess. Whatever may have been the previous state of health, it is usually visibly impaired after

the abscess becomes noticeable, although there are cases in which, from first to last, the patient is vigorous, and in ordinary condition. The course is very slow, often months elapsing before any signs of pointing are seen. The contents, when evacuation finally occurs, are of various characters, but never, or very rarely, resembling pus. Oftener it is watery, somewhat like skimmed-milk; sometimes "curdy," and occasionally colored, as green, bluish, dark-brown. In some instances it is albuminous, bland and unirritating; nearly always it is granular, giving a gritty feeling on rubbing between the finger and thumb; rarely is there any odor, unless bones are affected, but when there is, it is cadaverous or putrid. The evacuation is not often followed by subsidence, the discharge usually continuing for a long time, and occasionally ulceration occurs, which is obstinate. The pyogenic lining is sometimes wanting, the limiting membrane being the cortex of the gland; in other cases it is very thick, but of low organization, looking not unlike paraffine, even being brittle. There are cases of diffusion, with no limiting membrane, as occurs in the so-called psoas abscess.

The explanation of these phenomena is not difficult. When a gland is the seat of the abscess, the parenchyma is slowly destroyed, until nothing but the cortex is left. If an attempt at organization of a pyogenic lining is made, it will be very slowly accomplished, and few if any cells are derived from it. It grows by deposits from the contained mass, rather than proliferation; the fatty change in the cells being modified by the cholesterine in the old gland-tissue, giving the paraffine-like result. The serum exudation is slow, as the blood-pressure is not extreme, and the chronicity of the process gives opportunity for reabsorption, which favors a precipitation of the inorganic elements carried in it. When final pointing occurs, the relief from tension is not as marked, as in the case of the acute abscess, and there is no subsidence of the feeble inflammatory action.

Where the abscess occurs in bone, or tissue other than glandular, diffusion is the rule, and the chronicity of the pro-

cess, again, is not favorable to a limiting membrane. Ordinarily the pus, if such it may be called—will burrow for long distances before pointing, usually not until it reaches some fascia, or other obstruction, which it cannot pass. In this case the pus is filled with decomposed material, and when evacuated has a highly offensive odor.

Another condition, often resulting in abscess, must be noticed; glandular tuberculosis. In fact there are many who attribute all chronic abscesses to tuberculosis, and with good warrant. It is almost certainly the case when the process originates in the bones, and it is far from being unlikely that it is also the case in all other forms. A feature in the tubercular form of abscess, and one that is inexplicable if the “germ” doctrine as to tuberculosis is held, is the frequent absence of the bacilli either in the caseous glands before suppuration, or the pus in a later stage. The fact that the contents of such disorganized glands are tubercular is beyond question. If the common doctrine of pulmonary tuberculosis is true, certainly the micro-organisms should be abundant in the glandular form.

In prolonged suppuration, whether acute or chronic, a condition known as “hectic,” is developed. It is characterized by emaciation and prostration, night sweats and diarrhœa, pulse weak and rapid. The symptoms come on rapidly or slowly in proportion as the process is acute or chronic. Excluding the fact of suppuration there is nothing to distinguish it from tuberculosis, which, by the way, many esteem it to be.

Visceral Abscess.—Abscess of the viscera, or deeply situated outside of the cavities, is often a matter very difficult to determine. The symptoms are obscure in the commencement of the process, and very often a diagnosis is not reached until the pus is expelled, and thrown out in some of the excreta. In many cases, a diagnosis is not reached during life, but such occurrences are less frequent than formerly, owing to the greater boldness of surgical practitioners, who no longer hesitate to open any cavity of the body for purposes of exploration. There are certain symptoms that are, at least, suggestive

of suppuration, and of sufficient urgency to warrant an exploratory operation. Among these the most common is a rigor, during the course of an evidently inflammatory action, followed by a sudden and considerable rise of temperature. Such symptoms are always suspicious, and when accompanied by notable change in function, with a feeling of weight in the part, and sensitiveness to pressure, the presumption almost amounts to a certainty that suppuration has occurred. Owing to the loose texture of most of the viscera, the progress is usually very rapid, and the destruction extensive. The obscurity of the case is very great in the case of viscera that have no communication with the surface, as the liver, spleen, or brain. In the case of the lungs, kidneys or some of the pelvic viscera, pus soon appears, and the symptoms become explicable. The modifications of function that occur in other cases serve very well to locate the lesion, but inasmuch as the same symptoms would accompany any other, or rather *many* other morbid processes, the information furnished is small and may be very misleading. Possibly hectic is more pronounced in cases of visceral abscess than in the superficial form.

Diagnosis.—Notwithstanding the apparently unmistakable character of the symptoms in most cases of abscess, it is not at all times an easy matter to make a diagnosis. Acute abscess may be mistaken for hernia or aneurysm, or *vice versa*, and the chronic form may well be mistaken for tumors both cystic and solid. Possibly the points of resemblance, and differences also—may be better presented in the form of a table

	ABSCESS.	ANEURYSM.	HERNIA.
History.	Inflammation.	Traumatism.	Traumatism.
Form.	Globular.	Fusiform.	Pyriform.
Feel.	Firm.	Elastic.	Elastic or Vermicular.
Temperature.	High.	Elevated.	Normal, or Elevated.
Pulsation.	None.	Marked.	None.
Cough-impulse.	None.	None.	Marked.

	ABSCCESS.	ANEURYSM.	HERNIA.
Areola.	Inflammatory.	Little, or None.	None.
Color.	Red, bright.	Dark red.	Dark, or normal.
Pressure,			
Distal,	No Change.	Enlarges.	No Change.
Proximal,	No Change.	Diminishes.	Enlarges.
Lying Down.	No Change.	No Change.	Smaller.
In general.	Fever.	Local symptom.	Intestinal Disturbance.

It goes without saying that a question of diagnosis will only arise when the hernia or aneurysm is of recent formation. In the case of old aneurysm or hernia there can be no room for doubt if the abscess is acute. As to aneurysm, pulsation may be communicated to an abscess from a neighboring artery, and possibly there may be an adhesion to its sheath, or the abscess may be deep, beneath fascia. For these reasons alteration in pulsation by distal or proximal pressure on the artery, or even lifting the abscess up, in a direction away from the artery, will give negative results in many cases. Stress is therefore laid upon the alterations in *size* on pressure, which can be appreciated by anyone. It is true that the pulsation in an aneurysmal tumor is unique, a sort of expansion, and a feeling as though a live animal were struggling beneath the hand. To detect this, however, requires more or less experience, and therefore cannot be relied upon for general use, while alterations in size can be appreciated by all, unskilled as well as skilled.

Chronic Abscess may be mistaken for old hernia, or some form of tumor, oftener cystic. At times the diagnosis is very difficult, the condition being chronic, with none of the ordinary symptoms of inflammation. If the pus is very thin, the fluctuation will be as marked as in cysts. The appearance of cachexia, when present, will suggest an abscess, but as this is not constant it is of little value. As a matter of fact it is of comparatively little moment whether a diagnosis is made out

or not, as the treatment will be practically the same in either case, *viz.*, the extirpation of the gland or the tumor, whichever it may prove to be. Should a diagnosis seem necessary, however, resort must be had to the aspirator or exploring needle. This should be avoided, whenever possible, as damage may be done in various ways. A fæcal fistula may be established, and the patient placed in danger of peritoneal inflammation; an aneurysm, with very thin walls, may rupture with fatal hæmorrhage. For these reasons, if such exploration seems demanded, the surgeon should be prepared to go on with any operation that would be suggested.

Treatment.—Naturally there are three indications to be fulfilled, depending upon the stage of development, very largely. The abscess *may* be aborted, or later must be opened and cure without recurrence secured. *Abortive* treatment must be instituted before suppuration actually occurs, although I have seen cases in which the process was arrested after pus seemed to be formed. *Merc. viv.* is the typical remedy, although *Hepar s.* may be called for in some cases. The remedy indicated by the existing symptoms is the proper one to use, as a matter of course, but one of the above is usually the simillimum. *Nitric ac.* is often indicated by the pricking pain, as if from a splinter, or piece of glass.

Suppuration having proceeded so far that abortive measures are not indicated, the process must be hastened. *Hepar s.* is the usual remedy for this purpose, and has the effect to diminish pain while greatly hastening development. The question that presses upon the surgeon for answer is: Shall the abscess be opened artificially, or allowed to do so spontaneously? Another question: Shall it be opened before pointing or not? A categorical answer cannot be given. The first consideration, usually, is *where* the abscess will be likely to point, and if the probable site is desirable or not. Should it, for any reason be undesirable, either from extra hazard, or possible disfigurement, pointing should not be waited for, but an opening made as soon as pus is unmistakably present. Such an event would be post-pharyngeal abscess, with a tendency to

work downwards; or one on the cheek which might open on the face; or in some accessible viscus when discharge into the peritoneum is imminent. There are other cases, as in felon, where the abscess is underneath dense fascia, and pointing must be so greatly delayed that important structures may be damaged. In the case of felon, by the way, it is still a disputed question whether early incision, before pus has formed at all, may not abort the whole process. The testimony is somewhat conflicting, but I think there can be no question that the practice is a good one, as it, at all events, greatly shortens the attack. No matter what may be determined in the particular instances referred to, it is the proper practice to open abscesses when pointing occurs, not permitting spontaneous discharge if it is possible to avoid it. The reasons are, first, that it shortens the process, thereby diminishing suffering, and limiting the destruction of tissue. Secondly, it gives much less scarring than when spontaneous discharge takes place.

In opening an abscess, whether deep or superficial, precaution must be taken to avoid important structures, particularly blood-vessels and nerves, and to render the scar as small as possible by making the incision in some natural fold or crease in the skin, or, if there is no such mark, in a direction parallel to the fibres of underlying muscles.

To fulfill the third indication, or cure without recurrence—the first thing is to hasten the expulsion of the “core,” or pyogenic lining. This is accomplished, not by squeezing it (which may start up a new suppurative inflammation), but by giving *Sulphur* 30^x, one or two doses in twenty-four hours. It will be a rare occurrence if the core is not promptly expelled. In the absence of any special indication, *Arnica* is the remedy to cure the disposition to abscess, particularly boils.

As to the use of poultices, with a view to hasten suppuration, the sole consideration seems to be to use some material that retains heat and moisture well. These two elements are all that are needed, and apart from this, one material is as good as another.

X—ULCERATION

AN ulcer is an open sore, differing from a mere "abrasion" (which is a simple loss of epithelium), in the depth of the process; that is, it is a removal of proper vascular tissue. It may be due to morbid process of low intensity, operating after traumatism, or to something more energetic, as acute inflammation, or an organized deposit, as in syphilis. However produced it is a result of lost nutrition, the obliteration of small blood-vessels, and standing for an arrest of repair and exaggeration of waste. In the case of syphilis, or other constructive process, the tissues are filled by a deposit, more or less organized, which devitalizes the parts by compression, cutting off their nutrition, resulting in a sort of molecular degeneration. At other times the new tissue displaces the old, and, owing to its low grade of organization, soon degenerates, and is cast out, leaving an ulcer. To some extent this is the case with carcinoma, or malignant tumors in general, which are prone to break down. There is still another way in which the tissues may be destroyed, by processes not in the nature of morbid action. Among these traumatism, of various kinds—particularly burns—may remove so much tissue that the organism is unable to replace it; or the violence producing the lesion may be of a character to devitalize the surrounding tissues. In this category might be included prolonged pressure resulting in absorption. As to the production of the loss of tissue, it is a matter of minor moment how it is produced; the essential element is that there is a failure in repair. It may be inferred, from what has gone before, that this failure may be due to conditions general or local in character: also

that it is not essential that the condition should be pathological, as extent of surface may alone act as a maintaining condition, the emergency being far beyond the normal resources of the body.

The Exciting Causes may all be included under the single head of obstructed nutrition, from obliteration of small blood-vessels.

The Predisposing Causes are of greater variety, and can be considered under various heads, such as sex, age, occupation, habits, and surroundings or social condition.

Sex commands attention from the clinical facts, and yet it is not easy to give it an exact value. Women certainly present more cases of ulcer than men, up to the age of fifty-five or sixty, when there would seem to be little difference in this respect. The lives of most women are notably more eventful than men. The monthly crises, peculiar to the sex, the occurrence of pregnancy, the demands in lactation, possibly habits more or less sedentary, together with faults in dressing which derange the circulation, would seem to be sufficient to account for their comparative feebleness in repair, and resistance to morbid influences. Whatever the true explanation may be, the facts are that not only do women present more cases of ulceration than men, but there are certain varieties that seem to belong to them exclusively.

Age seems to have, as would naturally be expected, a most powerful influence on the production and maintenance of ulceration, using the term more with reference to habits of body than years of life. Conditions of the body in which repair is imperfect, and waste excessive furnish all the essentials for ulceration, and we find it occurring with greater frequency among those past the middle period of life. The usual location is on the lower extremities, between the knee and the ankle, although they may occur in any region where exciting causes may be operative. I am not aware that one sex exhibits a greater predisposition than the other; men and women, in the decline of life, seem to be equally liable.

Occupation as far as one exposes to traumatism more than

others may have a relation to causation. The reception of injury under normal conditions, simply means an incentive to repair. A condition of mal-nutrition may exist, favorable to the production of an ulcer, however, and yet none result, from want of proper determining cause. Unquestionably, therefore, other things being equal, those who are exposed to traumatism from the nature of their occupation will be more likely to have ulceration than will others, in this respect, more happily situated. There is another influence of occupation, based upon the contact with chemical or medicinal substances that specifically cause ulceration.

Habits, which include social condition and surroundings, may be considered one of the most potent factors in etiology. Habits of drink, debauchery, or use of opiates, as well as dwelling in damp, or badly ventilated quarters, together with insufficient food, furnish conditions in abundance peculiarly favorable to ulceration. Singularly enough the opposite end of the social scale furnishes ample provocation. The idle and luxurious present examples of mal-nutrition quite as potent in this particular, somewhat different in kind, as in the case of the poor and overworked, or those of vicious lives.

Common Characters:—All ulcers, of whatever character, and regardless of dimensions, have certain characters in common, and characters that have much to do with prognosis, diagnosis, and therapeutics. The earliest to appear, and that which is, perhaps, of greater value, for some purposes, is the **Areola**. This is a more or less circumscribed area of discoloration, after the appearance of the ulcer remaining as a zone surrounding it. It represents, prior to the actual lesion, the character of the process going on, inflammatory or necrotic, and later the progress of repair. Thus when inflammatory, the morbid process is still active; when simply hyperæmic, repair is progressing; when faint, repair is arrested or feeble; when dark, livid, angry, or œdematous, some destructive process is in operation. So also its texture, or rather its *feeling* furnishes important data. When soft and somewhat tumid, repair or extension is going on, depending upon the

color; when hard and seemingly adherent to deeper parts, the process is either indolent and chronic, or extensive destruction is threatened again, depending somewhat upon color and other characters.

Outline has reference to the general shape of the ulcer, as circular, oval, irregular, annular, semi-lunar, and the like. The state of the process, as to advance or repair, and something of its pathological character may be indicated by these variations in outline. Thus, if the tissue be of equal resistance, a circular form indicates repair, if it appears as a change from some other outline. It is the typical shape of the healing ulcer. An irregular outline usually indicates advancement. The annular or crescentic outline is often indicative of secondary syphilis.

Margin is the technical term for the edge, and its condition as to elevation or depression, sharp-cut or rounded, gives valuable indications. Ordinarily elevation, not excessive, and somewhat rounded, signifies repair; elevated to a greater degree, and more rounded, indolence, or arrest of repair; sharp-cut, advancement, or rather continuance of the process; depressed, sometimes rapid destruction, when they are undermined; or chronicity, when adherent to deeper parts.

The Sides are the more or less perpendicular slope from the edges to the base or floor of the excavation. When perpendicular the morbid action is still in operation; when undermining the edges, there is active destruction; when sloping towards the center, depending upon the degree, either repair or chronicity.

The Floor or base of the ulcer presents many variations. Sometimes it will be covered by granulations, their condition as to color, size and firmness indicating repair or chronicity. Again it is more or less flat, showing chronicity; or "worm-eaten," indicating continuing destruction; or covered with a slough, showing rapid advancement. Thus a disappearance of granulations shows a new or additional morbid action; the appearance of granulations on a hitherto smooth floor, indicates repair.

The separation of a slough may be the commencement of repair, when granulations will spring up—or another slough may form.

Discharge varies greatly in character, and furnishes valuable indications as to progress. The indications are the same as in suppuration in general, already referred to. As long as laudable characters are maintained, repair is going on; a sudden disappearance means some septic infection; watery, weak repair; excoriating, destruction; gradual disappearance, failure of repair or cure; absence, chronicity, and indolence.

Pain is a symptom of the least value, possibly, with the exception of useful indications for remedies. As is usual the tissue, and the susceptibility to pain will govern the degree and kind. Generally speaking, ulcers are not painful, at all events the pain is much less than the size of the lesion would seem to promise.

Treatment in general, should be adjuvant as well as medicinal, and yet the essential element is the indicated remedy. I have cured very many ulcers with the remedy alone, not making any local applications, nor using any of the ordinary dressings, and even making no change in the patient's habits of life in the smallest degree. Nevertheless, whenever it can be done, the cure will be much hastened if other measures are added to the administration of the remedy. The general indications to be fulfilled, as to adjuvants, is to equalize vascular tension, improve nutrition, and promote epithelial proliferation from the margins. It doubtless often occurs that one or the other of these must be ignored, and greater attention paid to the remaining features. Equalization of vascular tension may be secured by elastic bandage, of rubber or flannel—or adhesive strips; nutrition is sought in suitable food, and personal hygiene; epithelial proliferation may be secured by skin-grafting, or cell-grafting, sometimes reinforced by galvanism.

In cases of unusual malignancy, or with some peculiar characters that would seem to threaten the vitality of the part, a question of amputation might arise; such an event, however, must be of rare occurrence. Plastic operations, of various

kinds, curetting and the like, have been employed now and then, but the results have never been of a character to warrant their retention among curative measures.

The indications for remedies are more general than local, and do not need recapitulation in a work that does not profess to give more than "hints." The many repertories and manuals, to say nothing of the *Materia Medica* itself—are in every one's hands, and are reliable guides. Probably almost every remedy of which we have knowledge, has some relation to ulceration; it is manifestly impossible, therefore, to even give their names; it must suffice to mention, under each head, those that seem to be representative of a class. My own practice, it may be noted, is something as follows—as to the use of remedies: The general condition of the body as a whole is first considered, which will usually furnish indications for a number of remedies, the final choice (by "exclusion") being determined by the salient symptoms of the ulcer, chiefly pain, discharge, color of areola, and character of the granulations or the floor. The selected remedy is then given, rarely in a lower attenuation than the 30^x, at rather frequent intervals, say four times a day—until some change is apparent, no matter how slight, in any one of the local symptoms. Then the interval between the doses is increased, doubled, usually—until improvement is manifest, when all medication is suspended, as long as improvement continues. When it ceases, or begins to weaken, a few doses of the same remedy are given, in a higher potency, say the 200, to be discontinued when advancement is again well established. During the whole time, all medicated, "stimulating," or irritating applications are avoided, and nothing but water, without soap, allowed to come in contact with the ulcer. The water is caused to *flow* over the sore, with no violence, and not used more than once a day, unless the discharge is very abundant and of bad character. Of course the dressings are changed as frequently as they become soiled. Many an ulcer well-disposed to close spontaneously, has been kept active by local measures, which, however well intended, have the effects to destroy new tissue

as fast as it is laid down. When the discharge becomes laudable, the surrounding parts are cleansed, as often as needed but the ulcer itself is undisturbed; it must *not* be irrigated or "cleansed," as the material removed is often just what is needed for repair and protection; the surplus will find its way out without aid. In chronic ulceration, I give at least three weeks to a remedy before giving it up; in acute cases as many days will be sufficient.

Classification:—There is much diversity in the classification of ulcers, scarcely two authors agreeing. For some purposes, we might divide ulcers into atonic, tonic, and specific; in other words, those that have a tendency to cure, or remain stationary; those that are progressive; or those that are characterized by the laying down of new tissue. For purposes of mere generalization, such a classification might serve a good purpose, but for therapeutic purposes it would be very inadequate. I prefer to classify them with reference to causes, as far as they are understood, and find, I think, the following arrangement useful:

Idiopathic, in which the conditions are purely local, and without reference to dyscrasia of any kind.

Symptomatic, in which the ulcer stands as a symptom of some variety of morbid action, the location being purely a matter of accident.

Specific, those which are associated with specific affections, being also an essential feature of the process.

Such a classification, however, has defects, or rather is incomplete, as there are numberless varieties of ulceration in any one class. For instance, a simple, idiopathic ulcer, is a type of the whole class, it ~~is~~ true, and yet it may, and often does, take on other characters that would seem to put it in some other category, if the original characters were lost sight of. Errors in treatment, purely adventitious occurrences, may convert a healing ulcer into a growing one, and yet the conditions are non-specific, and there is no disturbance of the general health, or, should there be, it will be due to the ulceration. While, therefore, there may be many varieties under each

head, there are some that are so characteristic, and are met so constantly, that a sub-classification must be attempted. The following has proved quite satisfactory to me for practical purposes, in the past, and is offered at this time as having apparently justified itself.

Idiopathic Ulcers, may be divided into simple, weak, indolent, and inflamed—which while differing from each other very materially, yet have this one feature in common, that the manifestations are purely local; they are not dependent upon morbid action general in character, nor indicative of any dyscrasia or diathesis.

Simple Ulcers are the typical form, the tendency being to close spontaneously. We find the *arcola* is hyperæmic, the *outline* oval or circular, the *margins* moderately elevated, and rounded, *sides* sloping inwards, the floor covered with firm, florid granulations; *discharge* of laudable pus; *pain* insignificant. The remedy particularly indicated, in the absence of any special symptoms, will usually be *Calendula*.

Weak Ulcers, are a development from the simple form, often due to the abuse of stimulating topical treatment. The primary effect of such treatment may often be to promote repair, but if too long continued the secondary effect is to retard, or even arrest it, and the following characters are taken on. The *arcola* becomes faint, either a pinkish hue or light brown; in some cases fades away completely, but at all times is narrowed very much. The *outline* remains oval or circular, as a rule. The *margins* are high, and somewhat everted, or depressed, depending upon the condition of the granulations; that is the more the granulations are developed, the greater the elevation and eversion. The *sides* slope inwards very much. The *floor* is either flat, and covered with a shining albuminous secretion, or else the cavity is filled with high, flabby, and pale-colored granulations, often seeming semi-transparent. The *discharge* is either arrested entirely, or is profuse, stringy and albuminous. *Pain* absent, or there may be a stinging and pricking, often only on contact. The *remedies* are usually found in the class represented by

Alumina, *Kali bich.*, *Anti. crud.* In some cases I have had good results from *Sempervivum* (the house leek) used locally, in fact making a sort of poultice of the fresh plant.

Indolent Ulcers are eminently chronic, and often the result of energetic treatment of a simple sore, particularly when occurring on the lower extremities. I have never seen a weak ulcer on the lower extremity; nearly always they are on the trunk, particularly the shoulder. This has seemed to be so very uniform, that I am quite disposed to believe the weak and indolent forms are the same thing, the different characters being due to location, very largely. They are oftener met with in old people, who speak of them as "fever sores." The *arcola* is dark, wide-spread, and irregular, the integument seeming to be bound down to the bone, and immovable; scaly, and rough in spots, and in others shining, as though varnished. The *outline* is very irregular; the *margins* flattened or depressed: the *sides* sloping inwards, or steep; the *floor* is uneven, "worm-eaten;" no *granulations*; *discharge* either absolutely wanting, or a thin, brown, dirty and ill-smelling ichor; it is never profuse. There is not only no *pain*, but in most cases the ulcer and surrounding parts are insensitive, and almost anæsthetic. The typical remedies are to be looked for in the so-called "anti-psoric" group, such as *Sulph.*, *Baryta carb.*, *Sil.*, *Anti crud.*, and the like.

Inflamed Ulcers are also the result of energetic local treatment, as a rule, or of some traumatism inflicted on a simple one. The *arcola* becomes inflammatory, bright red or dusky, sometimes swollen and œdematous; the *outline* is irregular, depending upon the tissue; in tissues of fairly uniform texture the process extends with equal rapidity in all directions, while in other cases, it will extend faster in one area, and slower in another, depending upon the resistance it encounters. The *margins* may be depressed or elevated, but the edges are usually sharp-cut; the *sides* are either vertical or undermined, the more rapid the growth the greater the undermining. The *floor* is uneven, granulations that have been formed disappear, and a slough of some character takes its place. The *discharge*

is bloody, profuse, thick or thin, depending upon the activity of the process; the more rapid the process the thinner the discharge. Pain is usually considerable, and of almost any character. There is, also, more or less irritative fever, with some rise of temperature. *Bellad.*, *Puls.*, *Merc. viv.*, *Acon.*, *Rhus.* may stand for the typical remedies. Most of the symptomatic ulcers commence as *inflamed*, oftener, probably, from causes not local in character; if an idiopathic ulcer becomes inflamed, the rule is that it returns to the simple type again, unless the treatment is injudicious.

Symptomatic Ulcers, as already stated, are those that are dependant upon some dyscrasia, the locality being accidental, for the most part, the ulcer standing as a more or less essential indication of the morbid action. Even in this group, as a rule, the commencement of the process is in the simple form, but the typical characters soon appear. The varieties are as follows:

Sloughing Ulcers have a dark or livid *areola*, more or less swollen and œdematous; the boundaries are usually quite sharply defined. *Outline* is ragged, the process extending in one direction more rapidly than another, depending upon the resistance of the tissues. *Margins* are depressed, as a rule, somewhat sharp-cut; the *sides* are undermined, and the *floor* covered with a slough, no *granulations* being present. *Discharge* is putrid and watery, more or less mixed with tissue detritus, and *pain* is usually burning or gnawing, not particularly severe, but quite constant. There is always much general disturbance, fever, rigors, and sweat, but these symptoms vary in intensity, within very wide limits. The destruction of tissue is dependent upon the structure of the part invaded, and the activity of the process; in some cases extension is in depth, in others in superficial extent; in some rapid, and others slow, but at all times, such ulceration is serious, and the uncertainty as to what later phases may be, gives the observer concern. *Arsen.*, *Merc. viv.*, *Lach.*, *Nitric ac.*, represent the typical remedies, the essential feature rapidity in development, and wide destruction of tissue.

Irritable Ulcers are peculiar to women, and are usually associated with some menstrual abnormality. They are oftener on the lower extremity, over the crest of the tibia, and come on without assignable cause, at least as to traumatism. Those that I have seen give something like the following history: For some days before the appearance of the ulcer, there is a peculiar, pricking pain, in a small spot, felt only when walking or standing, with no discoloration, at first. In a few days, there will appear a dark, brown or purple spot, about the size of a five-cent piece, rapidly extending in all directions, quite regularly circular in shape. Suddenly a minute opening, about the center, will occur, which rapidly extends, so that in the course of a day or two, an ulcer from a half an inch to an inch in diameter will form with the following characters; *Areola* dark purple, and flat; *outline* circular; *margin* sharp, and flat; *sides* steep; *floor* dark colored like the areola, and flat, no granulations; *discharge* not very profuse, either thin and watery, or thick and jelly-like, but always dark colored; *pain* most intense, and of varying characters, but oftenest burning. The *remedies* are typified in the character of the pain; *Bellad.*, *Cham.*, *Asaf.*, *Merc. viv.*, and in the prodromal stage, *Hydrastis*.

Hæmorrhagic Ulcers are, in many particulars, practically identical with the irritable. They are the same in appearance, at times, and the symptoms are similar. The chief points of difference are: They are often multiple, and eminently chronic. They almost close between the menstrual periods, but become active again when the next period approaches, and discharge blood. *Arsen.*, *Carbo v.*, *Phos.*, *Silic.*, and *Sulphur* seem to be the typical remedies.

Varicose Ulcers have no characteristic features; they may be of any type, and are worthy of separate consideration solely from their connection with varicose veins. This connection, however, has a therapeutic value, inasmuch as the varicose veins being cured, the ulcer frequently disappears. *Nux. tom.*, *Ham v.*, *Sulphur* seem to be the remedies oftener useful.

Specific Ulcers, being a feature in specific disease, do not call for treatment at this place. As to the usual symptoms of the ulcer they may be of any type, and do not present any characters that, taken apart from the general dyscrasia, would have any significance, with one possible exception, to be dwelt upon in a later chapter. This is the character of the induration. Most of the specific diseases are constructive, the characteristic feature being the laying down of new tissue. In the case of syphilis, the induration is at the base extending little if any beyond the margins. In cancerous ulcers, the induration is more in the edges, and extends out to the limits of the *arcola*. In other particulars nearly all the ulcers accompanying specific diseases, there are no distinctive characters.

Remedies. It may serve a useful purpose to give the more particular indications for remedies, or at least such of them as are oftener called for. Probably every remedy in the *Materia Medica* will possess some symptoms relating to ulceration; those mentioned have been used in my practice, but it is very probable that the experience of others would add to the list somewhat.

Acid mur.—Stinging, itching, and painful ulcers; fœtid odor in the ulcer, although it is covered with a scurf; when touched there is a stinging pain; putrid ulcers, with a burning pain or heat in the edges; jerking pains. *Pus* fœtid and scanty. *Worse* in the afternoon and during the forepart of the night; also from cold, on lying down, on trying to lift any heavy weight, and in windy weather. *Better* from pressure, and on scratching. Left side chiefly.

Acid nit.—Drawing pain in the ulcers, which are very sensitive, and have an offensive odor; burning pain and heat in the edges; shooting and pricking pains; superficial ulcers; ulcers produced by *Mercury*. *Pus* fœtid. *Worse* in the morning, evening, and at night; also from bathing in cold water, on awakening from sleep, when lying on the affected side, and from being touched. *Better* in dry weather. Left side. (Since writing the notes from which this is copied, the following additional symptoms have been found, and proven reliable

in one or two cases: Readily-bleeding deep ulcers; fistulous ulcers difficult to heal; pricking in the ulcers. *Pus* copious, bloody, corroding, or ichorous).

Acid sulph.—Gangrenous ulcer; corrosive sensation in the ulcer; biting and cutting in the ulcer. *Pus* is corrosive. *Worse* in the forenoon and in the evening; also on getting up after lying down. Right side generally.

Antimonium crud.—Fistulous, deep or flat ulcers; pain as if they were burnt; spongy ulcers with an itching or pricking; ulcers with high exuberant granulations: spongy ulcers with a sore pain in them. *Pus* scanty. *Worse* in the evening; also from bathing them, on getting heated near the fire, and on turning the part. *Better* in the open air. Left side.

Argentum met.—Boring pain in the ulcer. *Pus* copious, gelatinous, bloody, or yellow, and sometimes corrosive. *Worse* in the forenoon, and in the afternoon; also when lying down in bed, and on descending an eminence. *Better* in the open air, on ascending an eminence, and on rising from the seat and moving about. Left side chiefly.

Arnica mon.—Jerking pain in the ulcer; bluish ulcers; readily-bleeding ulcers; indurated ulcers; induration of the surrounding skin; inflamed and itching ulcers; painless; pricking, pulsative, and sensitive ulcers; swollen ulcers with shocks, and feeling of tenseness. *Pus* bloody or gelatinous. *Worse* in the evening and at night; also from any bodily exertion, walking and moving, or turning the affected part. *Better* from warmth, when letting the limb hang down, from pressure, and when lying down. Left side.

Arsenicum alb.—Burning in the interior of the ulcer; pains are felt while sleeping; burning as if the ulcer were on fire; mortifying, putrid ulcers, with high edges, and shining redness of the surrounding skin; the base of the ulcer is either of a black-blue color, or has the appearance of lard; foetid ichor, and proud flesh in the ulcer; thin scurf on the surface, it bleeds slightly on bandaging it; flat gangrenous, or inflamed ulcers, the surrounding skin is of a dusky-red, or rather of a purple color. *Pus* copious, bloody, ichorous or corrosive,

putrid, thin and watery. *Worse* at night; also before falling asleep, and again on awaking, from the cold, and in cold weather, any exertion of the body, lying on the painful side, on ascending an eminence, after moving about, from drinking liquors, and in windy weather. *Better* from warmth, on getting warm in bed, lying on the sound side, descending, and on rising from the bed. Either side.

Asafetida.—Ulcers with intermittent, pinching pain. Excessively painful: pain relieved or changed to other kinds of pain on touching them.

Aurum met..—Mercurial ulcers; itching, shooting, or burning pains; bluish-red, deep, pustulous, swollen and painful ulcers. *Pus* is yellow and fœtid. *Worse* in the morning; also during rest. *Better* from motion, and while lying down in bed. Right side. (Low-spirited, sad, and constant thoughts of suicide.)

Baryta carb..—Gnawing pain; burning, or a pain as if burnt in the ulcer; corroding pains; scabby, crusty ulcers; indurated ulcers, difficult to heal; inflamed, itching ulcers; painless ulcers; pricking and pulsating; swollen ulcers, with a feeling of tenseness. *Pus* scanty, or totally wanting; gelatinous and scanty. *Worse* in the night; also from cold, lying on the sore side, lifting the part affected, and from pressure. *Better* when lying on the sound side. Left side.

Belladonna.—Desire to remain still; dread of motion; burning in the ulcers on touching them; soreness and inflammation around the edges, with a black crust of blood in the centre; deep, scabby ulcers with cutting pains; fistulous indurated ulcers, with induration of the surrounding skin; painless, though inflamed ulcer, or those with pricking, redness, and inflammation of the skin for some distance around them; inflamed, sensitive and swollen ulcers. *Pus* scanty, bloody and ichorous. *Worse* at night; also on motion, however little, and from the slightest touch. *Better* while standing. Right side.

Bryonia alba.—Ulcers with a smarting pain; stinging when moving; throbbing in the ulcers; induration of the edges. *Pus* brownish. *Worse* at night, after midnight, and in the

morning; also before falling asleep, from exertion of the body, on getting heated, when lying on the sound side, on going up an eminence, from motion, or motion of the part, from making pressure on the side of the limb opposite to the ulcer, on rising from the seat or the bed, in summer and winter, when the weather changes, and during walking. *Better* when descending an eminence, lying on the sore side, from scratching, and while sitting still. *Right side.*

Calcarca carb.—Unwholesome, readily-ulcerated skin; scrofulous ulcers; fistulous ulcers, with redness, hardness, and swelling of the surrounding skin; carious ulcers; cutting pain; inflamed or putrid ulcers; high and feeble granulations, without much pain; painful soreness; tearing and throbbing in the ulcers; the ulcers are white or yellow. *Pus* scanty and albuminous. *Worse* in the mornings; also just before falling asleep, on awaking, when letting the limb hang down, before menstruation, from wet poultices, in the spring of the year, when turning the part, and in wet weather. *Better* when keeping the limb elevated, in dry weather, and from rubbing or scratching. *Right side.*

Calendula off.—Excessive secretion of pus; inflamed ulcers; painful as if beaten; surrounding parts are red; stinging in the ulcer during fever. *Worse* at night, with some fever.

Cantharides.—Ulcers with itching and lacerating; burning in the ulcers; smarting and stinging in the ulcer. *Pus* copious, inodorous, slightly yellow, and sometimes tinged with blood. *Worse* in the afternoon, and at night; also from drinking coffee, from rubbing and from scratching. *Better* when lying down. *Right side.*

Carbo veg.—Pressure and tension around the ulcer in the leg; an ulcer which has become cured breaks out again, and instead of pus, emits a bloody lymph; the surrounding parts are hard to the touch; burning in the ulcer. *Pus* brownish, fœtid, or fœtid sanies; cadaverous-smelling and corroding scanty secretion. *Worse* in the morning, and at night before midnight; also in the open air, evening air, before menstruation, and from warmth. *Either side.*

Chelidonium.—Old, putrid, spreading ulcers; when lying in bed at night there is a chill with a warm body; deep, fistulous, spreading, itching ulcers. *Worse* in the morning; also in the open air, on turning the part, and when walking. *Better* from a firm pressure. Either side.

China off.—Boring, with painful sensitiveness in the ulcer; beating pain, only when moving the part; burning and pressing, or digging; fœtid, flat and gangrenous ulcers. *Pus* bloody, ichorous and fœtid. *Worse* at night; also in the open air, from motion, from the slightest touch, and in windy weather. Left side chiefly.

Conium mac.—Pains at night which rouse the patient from sleep; bleeding ulcers; the edge becomes black; gangrene of part of the ulcer; creeping, with a tensive pain; ulcers which are bluish, have a livid appearance and are tumid; pain in the part as if it were being beaten to pieces; burning, crusty and deep ulcers; painless, hard and fistulous; swollen ulcers, hard to heal; inflamed ulcers, with a feeling of tenseness. *Pus* fœtid, watery and ichorous. *Worse* at night; also on descending an eminence, on beginning to move, before menstruation, pain from rubbing or scratching, or when either sitting or standing a long time. *Better* on ascending an eminence, on letting the limb hang down, from motion, and from pressure. Right side.

Graphites.—Unhealthy ulcers; proud flesh in the ulcer; tearing; crusty or scabby ulcers; hard itching ulcers, difficult to heal; sensitive, sore, spongy ulcers, that emit a salty flux. *Pus* bloody, watery, acrid and corroding; putrid pus, or smelling like herring-brine. *Worse* at night, before midnight; also during and after menstruation, and on moving. *Better* when lying down, and from pressure. Right side.

Hepar sulph.—Mercurial ulcers; burning in the ulcers; burning in the night only; pains resembling recent excoriation; throbbing and shooting; ulcers with jagged edges, and surrounded by pustules; bluish, bleeding ulcers, with a burning pain in them, and surrounded by blisters. *Pus* may be laudable, acrid, or sanguineous; smells like old cheese; or it

may be foetid and ichorous. *Worse* at night, and in the morning; also on first waking up, from cold, when lying on the sore side, from pressure, on touching them; in clear, dry weather, and in a north or east* wind. *Better* when lying on the sound side, and in damp weather. Left side chiefly.

Kali bich.—Ulcers dry, form oval; have overhanging edges, a bright red inflamed areola, hard base; movable on the subjacent tissues; dark spot in the centre; after healing, the cicatrix remains depressed; the ulcers corrode and become deeper, but without spreading in the circumference; ulcers on the previously inflamed feet; ulcers on the fingers, with carious affections of the bones. *Worse* in the morning; also from cold, and during the summer. *Better* from heat. Either side. (Lippe.)

Lachesis.—The ulcer is large, and has a tendency to extend rapidly; surrounded by smaller ulcerations or pustules; considerable swelling, with a mottled, dark-blue or purple color of the surrounding skin; burning pain only when touching the sore; ulcers which are smooth, but have jagged edges, are surrounded by papillæ, and are bluish or livid in appearance. *Pus* scanty. *Worse* in the evening, and at night before midnight; also in windy weather, in the open air, on changing the position, from pressure, while sitting, and in wet weather. *Better* when lying down, on rising from the seat, and in wet weather. Right side usually.

Lycopodium.—Fistulous ulcers, with hard, red, shining and inverted edges; inflammatory swelling of the affected part; itching in them only or chiefly at night; also when touching them; gnawing, shooting or tearing pain; tumid ulcers, with elevated and indurated edges; surrounded by papillæ. *Pus* copious and albuminous; or sanious, gray, yellow, or acrid. *Worse* in the afternoon and in the evening; also while lying down on the sore side, before menstruation, on beginning to move, from pressure, while sitting, on being touched, and on beginning to walk. *Better* from cold, on motion, and on getting warm in bed. Right side chiefly.

* In Germany, from whence we get this proving, an east wind is a *dry* one.

Mercurius sol.—Spreading ulcers; spongy, readily-bleeding ulcers; ulcers are exceedingly painful, and sensitive to the slightest touch; unequal elevations and depressions (neither hot nor cold applications allay the intolerable darting, lancinating pain, G.); gnawing or throbbing pain; ulcers of a bluish or livid appearance, with hard, elevated and jagged edges; superficial ulcers, of a whitish appearance. *Pus* may be scanty or copious, and of almost any appearance (save laudable, G.). *Worse* in the evening, and at night; also in the evening air, from or during walking or motion, from the slightest touch, on getting warm in bed, and in wet weather. *Better* from cold (?), while lying down, and while sitting. Left side mostly.

Mezereum.—Pain of a burning character, of feeling as if from a recent excoriation; shooting pains; biting pains; pricking in the ulcer, or soreness; feeling of tenseness in the ulcer. *Pus* scanty or totally suppressed. *Worse* in the evening, and in the night before midnight; also from rubbing, from scratching, and from being touched. *Better* in the open air. Left side.

Natrum mur.—Superficial ulcers; red, angry-looking, smarting ulcers, surrounded by vesicles. No suppuration. *Worse* in the morning, and in the forenoon; also from bodily exertion, before and after menstruation, from motion, and on making pressure. *Better* while and after lying down. Right side.

Nux vomica.—Raised ulcers with pale red edges; pain as if being beaten to pieces; burning pain, as if burnt; jerking pain; prurient itching; sensitive sore ulcers, with a feeling of tenseness. *Pus* greenish and corroding. *Worse* in the morning, and at night; also in the open air, after menstruation, while lying on the back, on moving the part, when touching the ulcer, when drinking liquor or coffee, when walking, in clear, dry, windy weather, and in winter. *Better* when lying on the sound side, when sitting, and in damp weather. The right side chiefly.

Petroleum.—Fistulous ulcers; rapidly spreading; shooting pain, with elevated, indurated edges; deep or flat ulcers that

are difficult to heal; pricking in the ulcer's edges, or areola; proud flesh in them; redness of the areola; painful sensitive and spongy ulcers. *Pus* scanty, acrid and corroding; sanious and watery. *Worse* in the morning; also in the open air, from cold in general, and in winter. *Right side*.

Phosphorus.—Fistulous ulcers, with callous edges; gnawing pain; hectic fever. *Pus* foetid and badly colored; scanty, and again is easily secreted. *Worse* in the evening, and at night, before midnight; also before falling asleep, on awakening, when the weather changes, and in the wind. *Better* on awakening. *Right side generally*.

Pulsatilla.—Flat, putrid, carious ulcers; fistulous ulcers; itching, burning, or excoriated feeling in the ulcers; smarting and shooting pains; the surrounding parts are discolored; indurated and elevated edges; ulcers surrounded by papillæ. *Pus* copious, albuminous and yellow; also bloody or green. *Worse* in the evening, in the afternoon, and at night before midnight; also on changing the position, while lying on the sound side, after lying down, during menstruation, on beginning to move; also after moving, on pressure on the side of the limb opposite to the ulcer, on rubbing or scratching, while sitting, and in windy or wintry weather. *Better* in the open air, from cold in general, motion, on walking, and on wetting the affected part. *Right side*.

Rhus tox.—Small vesicles, turning to putrid, gangrenous and spreading ulcers; violent fever; tingling and smarting as if from salt in the ulcers; burning, creeping or crawling sensation, with a pain resembling a recent excoriation; smarting and soreness; ulcers surrounded by papillæ. *Pus* sanious and acrid. *Worse* in the morning, evening, and at night after midnight; also before falling asleep, in the autumn and spring, from bathing in cold water; also from exertion of the body, when lying down, from poultices, when the weather changes, and in wet weather. *Better* from motion, and motion of the affected part, while walking, and in dry weather. *Either side may be affected; chiefly, however, the left*.

Secale cor.—Bleeding ulcers; ulcers becoming black, feel-

ing as if burnt; painless ulcers; pricking, producing a prurient sensation. *Pus* putrid. *Worse* at night, also from being touched, and on getting warm in bed. *Better* from cold. Right side.

Sempervivum tect.—Immense jelly-like granulations; *pus* thin, scanty, colorless.

Sepia.—Ulcers with blisters around them; pain as if burnt; deep, crusty (scabby) ulcers; flat ulcers with digging pain; destitute of feeling; fistulous, hard ulcers; high elevated edges; hard to heal; jerking, itching or pricking; proud flesh in them; pustules around the ulcer, with redness of the areola; sensitive, sore, spongy or swollen ulcers; swelling of the edges, with tearing in the ulcer. *Pus* is copious, corroding, gelatinous, greenish or ichorous; or it may be scanty, putrid, viscid, sour-smelling, and whitish or yellow; thin, salty ichor. *Worse* in the morning, forenoon and evening; also before falling asleep, and on awaking, while sitting, and from being touched. *Better* on awaking, and when rising from the seat. Right side.

Silicea.—Aching pain in the ulcer; it becomes black at the base, or on the edges; bleeding from the base or edges; boring or burning in the edges, or in the areola; sensation of coldness in the ulcer; deep or flat, crusty ulcers; destitute of feeling; hard, fistulous or gangrenous ulcers; ulcers with high, hard edges; difficult to heal; jerking and itching in or round about the ulcers; pricking in the edges and areola; proud flesh in the ulcer; pulsating, putrid ulcers, with redness of the areola; sensitive edges; spongy ulcers, or only spongy on the edges; swollen ulcers with white spots and tearing pain. *Pus* copious, brownish, corroding gelatinous, or grayish, bloody, or ichorous; scanty, putrid, thin, and watery and yellow. *Worse* in the forenoon, afternoon, in the evening, and at night; also in the open air, when lying on the painful side, from pressure, and when the weather changes. *Better* when lying on the sound side. Either side.

Sulphur. Readily-bleeding ulcers; ulcers with raised and swollen edges; surrounded by pimples; fistulous ulcers; sting-

ing and lacerating in the ulcers; proud flesh in them; violent bleeding of old ulcers; irregular jagged edges; œdematous swelling, and reddish-brown discoloration of the skin. *Pus* thick, yellow, and foetid; or thin and foetid. *Worse* in the evening, and at night; also on awaking, from bodily exertion, while lying down in bed, before menstruation, from poultices, from being touched, and on getting warm in bed. *Better* from cold, on rubbing or scratching, and in dry weather. Left side.

Thuja.—Ulcer with indurated edges; elevated jagged edges; surrounded by blisters containing pus; deep, burning and fistulous ulcers; itching, pricking, and proud flesh in the ulcers; pulsating, spongy ulcers, or only spongy on the edges; feeling of tenseness in the ulcers; ulcers with serrated edges. *Pus* yellow. *Worse* in the afternoon; also on rising from the bed. *Better* from rubbing or scratching. Either side.

Tartar emet..—Deeply-penetrating, malignant ulcers; broad and deep sloughing ulcers; gangrenous, with hectic fever; ulcers surrounded by black pustules, which break down into deep ulcers. *Pus* absent; merely an oozing of foetid humor. *Worse* in the morning. Either side.

Zincum met..—Herpetic ulcers; bleeding and burning ulcers; destitute of feeling; itching, redness of the surrounding skin; sore ulcers; tearing, and feeling of tenseness of the ulcer, and the surrounding parts. *Pus* bloody and corroding. *Worse* in the afternoon and evening; also on getting heated near the fire. *Better* from rubbing or scratching. Left side.

XI.—MORTIFICATION

Mortification is a generic term, meaning death of tissues. More specifically we speak of death of soft tissues as *gangrene*, and of hard tissues as *necrosis*. These terms refer to the process; the dead tissue is a *slough*, when in soft parts, and a *sequestrum* when in hard tissues. The process of separation of the slough, is known as *sloughing*, and of the sequestrum, as *exfoliation*.

The essential cause for mortification is vascular obstruction; anything which cuts off the blood supply, suddenly, without affording time or opportunity for the establishment of collateral circulation, will be followed by death of the part. There is no question that there are micro-organisms that have a close relationship to putrefactive processes. There seems to be equally no question, at least in the minds of very many competent observers—that living tissue, of normal vitality, is unaffected, in any appreciable degree, by bacterial contact. As far as we are able to judge, from the study of pathological processes, mortification never occurs without vascular obstruction. The causes for this are various. In the majority of cases, probably, embolism occurs, either from traumatic causes, or some alteration in the blood; in another considerable number violence done the blood-vessels as division, or compression is causative. There are other cases, to be noted more at length later, in which changes in the blood-vessels occur from various causes, that determine changes in the blood (or these changes are due to the same general causes) that gradually obliterates systems of vessels, in such a way that extensive territories are deprived of blood. In still other cases, and it is

this class that puts the subject in the present category—inflammation may result in embolism, and thus mortification may be considered one of the terminations of inflammation. Whether an inflammation of high grade, that is great intensity—terminates in ulceration or mortification, depends upon the magnitude or number of the vessels obliterated; the vessels being small, capillaries or arterioles, ulceration results, a molecular or granular disintegration. If large vessels are closed up, the tissues die in mass, or as we say, mortification ensues.

One characteristic of mortification is somewhat different from other forms of morbid action. There is no retrogression. The parts once dying are dead beyond hope of revivification; they are forever lost to the economy. They are cast off, as worn-out dead matter, and the place from which they came is filled up by new material, not in any sense a conversion of the dead tissue. This fact is worthy of mention, inasmuch as it determines the therapeutics. The object of treatment is obviously to limit the extension of the process, hasten the separation of the dead tissue, and promote repair. There are many varieties of gangrene, based upon differences in semeiology, but from a pathological point of view they may all be included under two heads, the *acute* and the *chronic*.

Acute Gangrene, otherwise called “hot,” or “moist,” is usually of traumatic origin, but occasionally appears as a result of intense acute inflammation. The essential conditions are that the circulation should be suddenly cut off, the vessels themselves being in a normal condition at the time. Division or compression of blood-vessels, or embolism are the causative factors. The occurrence of embolism would argue something pathological as to the blood; other usual causes are entirely without pathological character.

The symptoms of acute gangrene come on in a certain order, the earliest being determined somewhat by the immediate cause. When embolism occurs, there is often a sharp pain, quite acute for the moment, at the point of lodgment. Sometimes this will continue for a long time, and again it will be of only momentary duration. There are cases in which it

is continuous during the process, only ceasing when sloughing has been accomplished, and repair well advanced. In traumatic cases there is usually little if any pain, the first symptom being a loss of pulsation in the artery beyond the point of injury, and rapid fall of temperature. Later the temperature will rise again, sometimes quite to the normal, or even a little above, probably due to the disorganizing process going on. There is usually early swelling of the part, and very shortly a change in color in the most distant parts, such as the tips of the fingers or toes, or the heel. The change in color is oftener a decoloration, at first, then becoming livid, and later a bluish black, shading off into the color of the part. The discoloration extends slowly or rapidly, depending upon the size of the vessel involved, and somewhat upon the state of the tissues, but increasing in rapidity as time goes on; that is decomposition once established, it goes on with increasing rapidity. When the point of obstruction is reached, further progress is arrested, and a new process commences, elimination and repair. This line, the *line of demarcation*, is usually sharply defined, a zone of inflammation, or high grade hyperæmia separating the dead tissues from the living. There is usually little pain, until the line of demarcation is formed, but it then sometimes becomes quite considerable. There is more or less irritative fever, becoming somewhat more pronounced when the line of demarcation is formed—in cases when the amount of tissue involved is considerable, becoming of high grade with mental disturbance, sometimes delirium, and again a mere apathy or confusion of the mind. Quite often there will be septic or pyæmic conditions develop, usually, however, late in the process. As the process of sloughing goes on, if permitted to do so, the general disturbance increases in gravity.

The dead tissues, at the oldest points, by the time the line of demarcation has formed, are greenish black, the skin peeling off in strips or patches; a putrid-smelling discharge, thin and watery; the later parts bluish black, swollen, and crepitating on pressure, from the gases of decomposition. The tissues undergo decomposition in a certain order: First the skin, then

the muscles; later the blood vessels, still later the nerves, and last of all the ligaments and denser connective-tissue. The odor accompanying this sloughing process is very offensive, and being caused by loading the air with the products of decomposition might be considered an active agent in the production of the constitutional disturbance. When sloughing is complete, the dead parts fall away from the living, leaving a granulating surface. It is needless to say, that in acute gangrene, the surgeon would not permit this process to go on in the typical way. The moment the point of obstruction in the artery could be determined, some surgical procedure would be instituted. This will be considered, however, later.

Prognosis depends first, of course, on the magnitude of the vessel involved, or the number. Arrest of circulation high up in the femoral for instance, would be a much more serious accident, than in the popliteal, both from the *size* of the vessel, and the number of secondary branches involved. Damage to the popliteal, as a case in point, would cut off the circulation of the leg entirely; while if lower down, one of the tibial supply would be lost, and a portion, at least, of the leg be saved. Prognosis, therefore, as to extent of tissue imperilled, would be dependent upon the size and number of the vessels destroyed, and the same fact would determine the danger to life. The constitutional symptoms are dependent upon the amount of tissue involved, as more vital effort is required to eliminate a large amount than a small one, and the demands upon the reparative forces are greater. The bodily condition of the patient, the facility with which repair is ordinarily secured, the state of health of the individual, must all enter into the solution of the problem. Questions of amputation are also to be considered, as in cases where the whole of an extremity is involved, amputation would be a necessity, either before or after the line of demarcation was established; while in gangrene of less extent, it would probably be outside of the case altogether. The nature of the parts involved would have a controlling influence on prognosis. Necessarily visceral gangrene, notably of the lung, or intes-

tinal tract, would be a much greater calamity than of one of the extremities. The occurrence of pyæmia, or septic infection would greatly complicate the case, as a matter of course, but not necessarily be fatal.

Diagnosis.—It is possible that hæmatoma, or ecchymosis might be mistaken for gangrene, in the living subject, and hypostasis, or suggillations in the dead, might be misleading in causing a false estimate of the cause of death. The history, when obtainable, would necessarily be an important item, but as the same injury that produces extensive ecchymosis might also result in gangrene, something more is occasionally required. The fact that the temperature is lowered, crepitation on pressure, no staining of the surrounding tissues, as would occur when there is extravasation, and the cadaverous odor should distinguish it from ecchymosis, during life. *Post mortem* indications are easily obtainable, and positive. The areola, on the *forming* line of demarcation, might, perhaps, be mistaken for staining, in exceptional cases, but as a rule it is inflammatory, and quite different.

Treatment depends upon the cause, and extent more than any other elements. In traumatic cases, that is when the artery is divided, if collateral circulation is not established, gangrene of course is inevitable, and treatment must be directed to getting rid of the dead tissue as speedily as possible. If the whole circumference of a part is involved, and the process extends through the entire structure, amputation would be indicated as soon as the point of division can be determined, provided other things are equal. If there should be much shock, consequent upon the accident, or great depression from hæmorrhage, it *might* be a question whether the operation should be secondary, intermediary, or primary. The general rule of operative surgery, is, I think, that primary operations are to be preferred, as there is much less danger from the additional shock, than from complications that would probably arise later. Not only is there danger from septic infection, but the effort required to dispose of the dead tissue must be considered. Should only a portion, of an

extremity be involved, poultices might hasten sloughing, and portions of the slough removed as fast as they become detached. The raw surfaces left are to be treated as simple ulcers, *Calendula* being the typical remedy. If the surfaces are large, skin grafting will probably be needed. Septic conditions, should they arise, are to be met with *Rhus*, *Arsenic*, or *Lachesis*, according to indications, as will be shown in a later chapter.

Gangrene arising spontaneously, from embolism, as a result of inflammation, calls for different consideration. There is always a possibility of the process extending, by new thrombi forming, or breaking up of the original clot, the fragments lodging in other locations, and thus extending the area of devitalization, in a very irregular manner. When seen early, before the necrotic process has fairly begun, it is occasionally possible to break up the clot, by massage, the small fragments lodging in distant and smaller vessels, producing comparatively insignificant results. *Arnica* should as a rule, be given in these cases, as it often disposes of the clot in a very expeditious manner, and much attention given to position of the part and keeping up the temperature, with a view to establishing collateral circulation. Amputation is not, as a rule, to be thought of, in these cases, until the line of demarcation forms, and the extent of the process has been clearly indicated. *Secale*, and *Arsenic*, are occasionally indicated, for intercurrent remedies. As to the slough, in inoperable cases, it is to be treated in the manner indicated above.

Chronic Gangrene.—This form of gangrene is radically different, in cause, semeiology and significance from the acute form. It is spoken of as *dry*, *cold*, *senile*, *spontaneous*. The *symptoms* of this form are a slowly extending gangrene, often commencing in points other than the distal extremities extending in both directions. The parts shrink, and become mummified, often looking like charred tissues; at other times they are more soft and pliable, but rarely, if ever swollen and succulent. There may be sloughing, almost completed, and the process start up again, in some new direction, so that a line

of demarcation is very irregular, and not to be relied upon, at all times, as indicative of an arrest of the process. The constitutional symptoms are severe, not acute, but indicating an exceedingly serious menace to life.

The *causes* are changes in the blood-vessels, either atheromatous degeneration, or calcification, such as are incident to old age, or to those whose habits have brought on a premature senility. The vessels becoming smaller and smaller, the circulation is slowly interrupted, thus the results will be different from a *sudden* closure, such as occurs in the acute forms. When the larger trunks are finally closed, some progress has been made, of course, in the necrotic process at more distant points. In all probability there are changes in the blood that predispose to coagulation, and yet such conditions are not necessary. The interruption in the vessel by the slowly increasing stenosis, and the loss of muscularity in the vessels so affected, are conditions that would readily determine coagulation.

Prognosis is much more grave than in the acute form, inasmuch as the condition is due to pathological processes that are of the most serious character. Cases in which a line of demarcation is sharply formed, and no tendency is shown to extend beyond this, may be treated as acute gangrene.

Treatment, in a sense, is expectant. That is, it is designed to arrest the progress, and later to get rid of the slough. Amputation is rarely indicated, as repair is uncertain, and gangrene of the stump to be feared. Notwithstanding, I have twice amputated the thigh, for gangrene of the leg, in old men, with good results, the patients living some years, and dying from causes unconnected with the gangrene, or the conditions causing it. The gangrene having become established, no matter to how small a degree, there is little to be done, as a rule, but to meet indications as they arise. When the condition of the vessels is recognized early, it may be possible to avert the threatened danger by the use of appropriate remedies, and such adjuvant measures as would have a tendency to facilitate the circulation of the blood. *Secale* seems to be a remedy oftener indicated than any other. *Lachesis*, *Arsenic*, or *Baryta carb.* are credited with cures.

XII.—SURGICAL TOXÆMIA

THERE are conditions that may be considered modifications of the inflammatory process, some of them with constructive characters, and others destructive. Among the former we will find tumors stand as types; the latter will include all forms of toxæmia, having any relation to traumatism. The primitive classification of these processes is into septicæmia, and pyæmia, while the former may be divided into three forms or varieties, which have been given different names by different authorities. The differences being mainly in degree, however, it will answer our present purpose to ignore the secondary classification in this discussion.

SEPTICÆMIA.

It is affirmed, with all the strength of recognized authority, that septicæmia, pyæmia, hectic, traumatic fever, and purulent infection, are convertible terms, indicating one and the same condition, perhaps, to a certain extent, different stages and degrees of the same morbid action. It would be the height of presumption, in one with such slender claims to notice as myself, to dispute a statement made with such positiveness, and coming from such unquestioned masters in our art as BRYANT and BILLROTH, were it not for the fact that the surgical profession are not by any means an unit on the question, and names of equal prominence are arrayed on either side. That there is a marked difference in etiology, semeiology and pathology, between septicæmia and pyæmia, none can or do deny. As homœopaths, it is proper for us to enquire if these points of

difference are not indicative of distinct forms of morbid action, and be careful that we do not give adherence to either party in the controversy until we have well studied the question, and are prepared to give a reason for the faith that is in us.

Septicæmia, translated liberally, means "putrid blood," and is a condition of impaired nutrition supposably due to the absorption of putrefying organic matter, whether derived from necrotic processes in the neighborhood of the focus of absorption, or introduced from without in the form of minute germs and organisms. There are two essential factors that must be present in every case, *viz.*, a wound or a traumatic condition simulating one, and septic material present for absorption. The phenomena can never be established spontaneously in an uninjured organism, and going more deeply into the subject of etiology, I risk the assertion, that there must be a physiological change in the part, if not the whole organism, antecedent to absorption. A wound in healthy tissue, the individual being in an ordinary state of health, does not have any pathological significance whatever; the wound itself is not only purely accidental, but at once calls into activity forces that are designed to meet just such exigencies, and hence while a condition of hyper-nutrition is set up, it is strictly physiological. Now whether the wound be open to the air or subcutaneous, exercises a very important influence on the result, so far as absorption is concerned. An open wound passes through the following routine in a normal process of healing: First a stage of so-called quiescence, in which there is an elimination of foreign material, whether it be devitalized organic particles, or material from without. Second, a stage of active repair, during which lymph is thrown out, new tissue is organized, and new blood vessels formed. In both of these stages, it will be observed, the physiological phenomenon is one of *excretion*, largely if not entirely. There is comparatively little if any absorption, because there is little if anything to be absorbed. It is manifest, therefore, that if excretion is the normal function in repair, there must be some notable alteration in function when absorption occurs. Hence, it is evident,

septic absorption is the result of a local change of function, pathological in character, and that must be put into operation before the absorption can occur.

In the case of subcutaneous wounds, to some considerable extent, different conditions obtain. There is usually much exudation to be disposed of, blood or serum, and perhaps devitalized organic particles, depending upon the character of the injury. Even here, in a healthy functional state, absorption is restricted to aseptic matter, devitalized and foreign material being ejected if an outlet can be found. In the absence of an outlet, an abscess may form; if absorption of all the exudate does not occur, it undergoes fibrinous organization, as is seen in meningeal effusion in the cranium. As a matter of fact there must be, therefore, even in the case of subcutaneous wounds, some perversion of function before the conditions essential to septic absorption occur. The various tenotomy operations are cases in point, where there is much exudation, even extravasation, and yet repair is secured without inflammation.

It would be an interesting study to enquire what is the change that thus converts an excreting surface into an absorbing one, but our absolute want of definite knowledge, and the conflicting nature of the theories offered, forbids such a discussion at this time. We must concede the facts as they exist, that prior to absorption there must be a recognized change in local functional activity.

Similar conditions exist in connection with what might be called accidents, even while there is no true wound present. We find more cases of septicæmia in general practice amongst parturient patients than any other, in which the open sinuses, and torn vessels simulate an open wound. Here again the function of the part is notably excretory, and, if memory serves me, there is some change in bodily function prior to the actual suppression of the discharges. In either case, however, whether medical or surgical, the reëstablishment of excretion, at once disposes of the septicæmia, unless too much time has been lost, and the fact seems to throw much discredit

upon the authenticity of the facts upon which the doctrine of antiseptic surgery is based. But of this I will speak at length later, simply remarking at this time, as a fact to be borne in mind, that repair practically ceases the moment absorption actively commences. Repair means, abundant exudation of formative elements, and active cell proliferation; with a cessation of exudation, there is a lack of material out of which tissue is made, and repair cannot be carried on. Absorption also means this: There is no *local* change, except in obedience to reflex action at the centres of life; it does not come from external agencies (except as exciting causes), but from internal, systemic, functional abnormality.

The effect of this absorption of septic material is to induce local inflammation, consequently disturbed nutrition; and secondarily, general febrile disturbance and mal-nutrition. In pursuance of my present plan, it may not be necessary to go into the question of minute pathology. it will suffice to call attention to the fact that septicæmia represents a condition of chronic inflammation.

SIMON (*Holmes' Syst. of Surg.*, I., p. 60), thus speaks of the retention of putrefiable organic substances: "It needs not to be argued that the due defecation of the body is as important to it as its food. But in the present context the student will do well to reflect particularly on the immense amount and complexity of those molecular changes which silently and almost secretly minister to the defecation; how the material of every acting organ changes in its every act, by waste, as also by renewal; how products, which eventually appear more or less oxydized and altered in the breath, and sweat, and urine, and fæces, are uninterruptedly being thus disengaged, and, as it were, moulted from the living textures; how, while the body grows its healthy growth, these declining products are incessantly merging themselves in the blood which washes past their source—merging themselves in it, not as urea and carbonic acid, and excretion, but in impermanent forms infinitely more complex. Reflecting on these many results of textural drainage, each with its own protean constitution of effete devitalized

material, the student will easily conceive how important a mal-nutrition it may be for any of them to remain stagnant among the living substances, instead of continuing its progress to excretion." Does not such a suggestion as our author has given, carry with it a conviction that with excretion practically increased, by the retention of its products, even while it is actually suspended, as far as normal function is concerned, the state of septicæmia must represent one of exaggerated waste?

Whatever the true cause may be, the symptoms and cause of septicæmia are always of a chronic character, and are as follows, in a typical case: There is a sudden rise in temperature, with other symptoms of fever, restlessness, and perhaps a chill or simple suggestion of chilliness at the commencement of the fever; the secretions of the wound, or the discharges from states simulating a wound, become more and more scanty, and in extreme cases cease altogether, or nearly so; the part becomes more or less swollen and œdematous; the course of the lymphatics is marked on the skin by red lines; the nearest gland or system of glands become enlarged and tumefied, and may proceed to suppuration. Emaciation is characteristic, with disturbance of digestion, anorexia and often nausea and vomiting, or a simple disinclination for food. In the case of puerperal septicæmia or lesion in the near neighborhood of serous surfaces, there is likely to be inflammation of such membranes; but in other cases, excepting in very aggravated instances, the mischief is confined entirely to the lymphatics. In the majority of instances the morbid manifestations cease with the suppuration of the glands; but in others it may extend to the veins, and pyæmia result. The symptoms may be studied in two groups, the general and the local. In the former, the nightly rise of temperature, continued fever, progressive emaciation, and gastric disturbance occupy the first rank. The variations in temperature are rarely greater than one or at most two degrees, but at no time, except when a fatal termination is to be feared, does the mercury indicate anything below the normal standard; constant elevation, with nightly rise, is the prevailing characteristic. The pulse is

usually above an hundred, prevailing weak and compressible, the strength of the pulsations not increasing with the rise in frequency. There are no distinct chills, in fact there may be nothing suggestive of chill from first to last; usually, however, there is a rigor at the commencement of the process, and at irregular intervals afterward, as when suppuration of the glands occurs. Emaciation is a marked symptom from first to last; in grave cases the patient seems to melt away, visibly losing weight in the interval between the physician's visits. The mind may become impaired, not the apathetic state of pyæmia, so much as the more active forms of delirium, aggravated at the periods of maximum heat. There may be sweat, but oftener, the skin is dry and harsh, with a peculiar pungency felt on application of the hand. The bowels are inactive, unless in the later stages of threatening cases, when diarrhœa, more or less involuntary occurs. The urine is scanty, loaded with urea, perhaps albumen, sometimes an evacuation of the bladder occurring but once in twenty-four hours. The whole array of symptoms closely resemble many of the ordinary forms of continued fever, and present nothing pathognomic taken apart from the local state.

SMITH (*Operat. Surg.*, p. 68) says: "When the condition arises from absorption from a wound, the earliest indication will be a suppression or alteration of the discharges, united parts fall asunder, and the edges of the wound become somewhat everted." The following case may assist in individualizing septicæmia.

Case.—H. T. B. Was called April 17, 1879, by my friend, Dr. J. D. CRAIG, of Detroit, to visit a case with him that might call for operation. Found the patient, a young man of twenty-six, with an enormously large testicle, on the right side, with a slight discharge of pus through two small punctures in the scrotum. Learned that he had been a victim of congenital hydrocele, and had undergone two tapping operations. The last operation not affording relief, and no subsidence of the swelling following, in fact, a sudden and notable increase in size was observed—a *seton* was introduced, and retained for

a number of days. Diagnosis, traumatic cystic sarcocele, due to injury to the testicle in the second tapping, and the introduction of the seton, which was subsequently found to have passed directly through the testicle. His condition was bad; cold, clammy perspiration; rapid, weak pulse; pale, drawn face; frequent rigors; slight diarrhœa, partially involuntary, and a peculiar sweetish odor to the exhalations. Septicæmia was recognized, and immediate removal of the testicle counselled. Accordingly, on the following day, the gland was removed, found to contain a pint of horribly offensive pus, which had burrowed up the spermatic canal for some distance, the inguinal rings being large enough to admit the finger easily. Prognosis guarded. Had a smart secondary hæmorrhage, in about six hours, due to the hypertrophied condition of the parts, and another slight one later in the night. He became much distressed with abdominal pains, frequent sighing respiration, wanted to be fanned occasionally, and all the septic symptoms much increased. Gave *Carbo veg.* 30, a dose every hour. DR. CRAIG gave, also, an occasional dose of *Arsenic*. He soon improved and made a good recovery. The indication for the *Carbo veg.* was the sighing respiration, and the accumulation of flatus, giving pain, which was mitigated when discharging it.

Finally, the morbid action, as far as objectivity is concerned, a most important diagnostic fact is found in the restricted territory involved, rarely extending beyond the first gland implicated, or exceeding the limits of the part first invaded (if an extremity), or, under more unfavorable circumstances, extending to the other side of the body. The character of the objective group of symptoms, therefore, might well give color to the assertion that the process is a purely local one, hence entirely dependent upon external agencies. On the other hand the subjective group are as distinctly in favor of its constitutional origin and nature, which, if established, must be fatal to the so-called "antiseptic" doctrine and practice. The objection we find made, that the constitutional symptoms are "or may be" (it is more carefully put) of a purely secondary

character, coming on after the local mischief has become established, is very easily met: The *first* symptom of septicæmia is the sudden rise in the temperature, followed, usually after some hours, by the local changes noted above. There may be cases in which the apparently simultaneous appearance of the two groups might cause embarrassment in determining priority; but the remembrance that the nerve centers must be impressed to produce the constitutional disturbance will point out the necessity for the lapse of an appreciable period of time after infection, which can only be shortened by the unusual energy of the local excitant, or a phenomenal receptivity on the part of the patient. The first disturbance being a variation in temperature might well be overlooked unless the thermometer was carefully used at short intervals.

There can be little doubt that modifications of inflammation play a very important part in the production or maintenance of septicæmia. The primary alteration in the blood; the exaggerated waste; the retention of exudation; the lymphatic derangement, and many other prominent characteristics of inflammation furnish suitable conditions for both the production of septic material and the absorption thereof. I think, therefore, to repeat an earlier proposition, that it can be agreed that septicæmia represents a profound vital disturbance which results in the suppression of excretion and establishment of absorption, without essential relation to external conditions, excepting as the latter may modify general nutrition. This theory is in perfect harmony with the prevailing ideas of etiology in the Homœopathic school, and would seem to be well-sustained, apart from this, by a proper consideration of the admitted phenomena characterizing the state. Let us now examine the grounds upon which an opposite theory is based.

The assumption, for it amounts to little more, upon which the antiseptic theory is constructed, is that septic infection is due to the entrance of micro-organisms into the body, through open wounds of more or less magnitude. It is not necessary to argue the doctrine of bacterial pathogenesis again; the matter has received attention elsewhere. At this time, how-

ever, the fact must be recalled that in all cases of traumatism, the surfaces of the wounded tissues are swarming with bacterial forms of all kinds, and the same condition is found on unwounded surfaces. Indeed, not only is the presence of these organisms not incompatible with health and normality, but they may be considered essential to its preservation. But dismissing this discussion now, the fact must be emphasized that for therapeutic purposes it is a matter that admits of no argument. Admitting that the bacterial infection is the true cause for septic infection, either they must be prevented from entering; or having entered, they must be destroyed; or, if this is impossible, the consequences must be met by indirect methods. There are no means known to science to keep them out of the wound. Therefore dismiss that. They can only be prevented from doing mischief by keeping up the normal resistance of the tissues. This we cannot do with germicides, because the tissues suffer just as the microbes do. The indicated remedy is the best "germicide." Evil consequences having resulted, the ordinary germicidal treatment is impossible, and we are powerless, unless we have remedies at hand that will establish healthy resistance. It is true that a modified bacterial theory is not incompatible with an enlightened therapeutics, yet there seems to be a very general admission that the state of the tissues determines the result as to infection. The rational conception, it seems to me, would be that anything which promoted repair, would be the proper germicide; in other words, it is not a germicide, properly speaking, that we need, but a vulnerary. The fact must be admitted—admitted because it has all the authority of actual demonstration—that a cell-destroyer cannot be a cell-producer; hence germicidal and vulnerary properties are antagonistic. Lastly, how do we reconcile the conflicting character of statistics, not only *pro* and *con* as to antiseptics, but as to the different agents in the alleged antiseptic group? The answer is equally easy, but minute demonstration is unnecessary.

That statistics are often untruthful, but undesignedly so, ASHURST has shown in (*Inter. Encycl. Surg.*) debating the

questions relating to different methods of treating the stump after amputations, by the citation of an immense number of reports, that taken singly would prove very conclusive in any of the categories, but when analyzed and rearranged, by one indifferent to the result, vary greatly. Thus a writer will tabulate hospital reports of amputations in general, and getting the ratio of mortality will compare it with his report, perhaps of selected cases, and find a ratio immensely in his favor. Now analyze the hospital report: As given by our author it will simply state, number of amputations, so many; recoveries, so many; deaths, so many; ratio of mortality, so and so. No attention is given to questions of sex, age, whether for disease or accident; the size of the part, previous bodily condition of the patient, whether performed primarily, intermediately, or secondarily, and the kind of operation all exercising important bearing on the result. Thus analysed, the statistics have a very different significance; to make our author's tables of any value, he must compare his cases with exactly similar cases, in all particulars, and then, as the question is on the merits of dressings, the time consumed in treatment must enter into the enquiry as well as the mere question of mortality. If this is true of statistics of operations, how much more is it true of methods of treatment? Let us secure an accurate report of a number of selected cases, submitted to one kind of treatment, with reference to protection from septic infection and length of time consumed in completing repair, and compare it with a similar list, embracing the same considerations, of cases treated by another method. As far as ASHURST has gone, in this comparison, he finds the differences are small indeed, so much so that the question of selection of a method is after all determined more with reference to convenience and facilities at command than any therapeutic consideration. In other words, no matter whether you use open air, water, dry earth, full "Listerism," the method of Guerrin, or Jodoform, about the same length of time is consumed, the facility of union, and the same good results, taking cases as exactly similar as possible for a guide and comparison.

The presumption is very fairly to be stated, that in a large proportion of injuries and wounds from operation, it requires very active and energetic interference to retard or modify repair, a good result being the rule even when the case is left entirely to nature. Indeed, there can be no question that very many cases have resulted disastrously that might have made a good recovery had they not had surgical care. President GARFIELD's case, I fear, was one in point.

From a therapeutic point of view, we have two problems presented for solution, one of prophylaxis, and one of treatment if the former fails. The first indication is met, in placing the body in the best condition obtainable, as to nutrition, and particularly to facilitate, by all means in our power, the prompt closing of the wound. Of course we are engaged in studying this condition as it is presented to the surgeon. The wound is to be treated, as long-established homœopathic principles, tested by hundreds of practitioners, have proved the most desirable. Pain is to be arrested or controlled as an element of danger, apart from all other considerations, on account of the nervous disturbance and exhaustion induced thereby; *Hypericum* seems to accomplish all that could be desired in this direction. *Arnica*, when there is effusion of blood to be disposed of; *Calendula*, when there is much loss of substance, and the gap to be filled by granulation; *Staphysagria* when the incision is smooth, the wound can be closely approximated, and there is no foreign matter to be expelled; and *Ledum* or *Stramonium*, when injuries to the nerves are the prominent lesion, and there is reason to fear tetanus, are remedies with which we are all familiar, and which have a reputation amply sustained when put to the clinical test. With a proper use of such precautions, and a mechanical treatment of the wound in accordance with common and well-known surgical principles, there can be small opportunity for septic trouble, particularly where proper nutrition is attended to. There can be no need for germicides, as a very simple and familiar illustration will show. Consider the method of repair of wounds in animals. From time immemorial the rapidity with which wounds in dogs

heal has been cited as an illustration of typical repair. It was this that led to the many attempts to form a scab artificially. Yet, consider, there are no antiseptic precautions taken, and never have been, in treating wounds in animals, and the most ignorant observer has learned to leave them alone, to "nature," as they phrase it. The conditions are such as we would suppose are peculiarly favorable for septic trouble if admission of germs is the cause, and the contact with dead organic matter, furnished by the inspissated lymph, dried blood, matted hair, and extraneous dust, should add to the danger ten-fold. I am not aware of a single example of septicæmia in the case of wounded animals, and we know, also, that wounds heal with remarkable facility; in fact, when death occurs from injury, it is nearly always from the primary lesion; rarely, if ever, from secondary affections.

Treatment is quite successful if the case is well understood and the character comprehended early. Moderate stimulation must not be neglected, and external temperature attended to. The first indications of resolution, when there is an open wound, will be a return of the discharge, or an improvement in its character; otherwise there will be an improvement in the pulse, the tongue will become moist, some interest will be taken in what is going on around and the skin will feel more natural. The remedies in which experience has given me the greatest confidence, are *Arsenic*, *Lach.*, and *Carbo veg.*, perhaps *Rhus* may be useful in some instances.

Arsenicum.—This remedy takes the first rank, in my practice, and I have seen very few cases in which it was not indicated at some stage of the treatment. The shorter the incubatory period, and the greater the severity and rapidity of development, the stronger the indications. The more characteristic symptoms are as follows: Great prostration, with an apathetic condition of the mind, whilst the body is very restless; diarrhœa profuse, watery, and scalding; œdema, or anarsarca of the lower extremities; thirst for cold water, but vomiting after drinking.

Lachesis.—HUGHES (*Pharmacodynamics*), considers this a

first class remedy where pyæmia is also developed. My colleagues have on several occasions, verified its value. It is chiefly indicated by the apathy peculiar to the condition, particularly when there is bodily lassitude as well; the skin is dark colored, mottled, but little œdema. In one case there was a discharge of black fluid blood, from the wound, as in snake-bites, and whilst the patient ultimately died, the symptoms were promptly improved by this remedy.

Carbo veg.—The symptoms calling for this remedy, are chiefly visceral. There is bloating of the abdomen, rolling of flatus, great internal heat and much prostration with sighing respiration. The patient requires to be fanned to give him air.

Rhus may be of service when the skin is chiefly affected, running into an erysipelatous state, with great bodily restlessness, and general typhoid conditions.

PYÆMIA.

We have found, or may assume it, that septicæmia represents a disturbance of nutrition chiefly or entirely in connection with the lymphatics; it may now be stated, that when the disturbance reaches the blood, with a tendency to the formation of thrombus, through an increased "fibriniferousness," as SIMON calls it, we have reached a stage far in advance of that represented by septicæmia, but which has only a partial relation thereto, inasmuch as this "thromballosis," may appear entirely without such relation, appear *ab initio*, as it were.

Pyæmia literally means "pus in the blood," or purulent blood, and is a term born at a time when suppuration was very differently appreciated from what it is to-day. It was supposed that pus found entrance into the circulation, and was carried to different parts of the body forming neuclei for abscess wherever lodged. The main features of pyæmia, as serving to distinguish it from septicæmia, both in cause, progress and termination, are its acute character, regularity of the rigors, and formation of abscesses, in various and widely separated parts of the body, known as multiple or metastatic abscess.

In the large majority of cases, the first symptoms of septicæ-

cæmia appear within three days from the reception of injury. In cases of traumatic origin, pyæmia rarely, if ever, appears until after septicæmia is well established, appearing as a sequel to that process. But the symptoms are so marked, and there is such a radical change in the character of the malady, that none need be led into error. The temperature, it has been shown, in septicæmia is never below normal, unless a fatal issue is imminent, and does not run very high above. In pyæmia, on the contrary, there is a marked want of periodicity in these fluctuations; in the course of a few hours there will be a variation of eight or even more degrees, giving a characteristic appearance to the chart. It will fall, with no premonitory indications, a degree or two below normal, and in a few hours will shoot up to five or six above; instantly, almost, drop down below starting point, fluctuate between that and a degree or two above, and then shoot up again, in favorable cases not reaching its former altitude. The long needle-like marks in a pyæmic thermograph have become diagnostic with me, and once, if not oftener, the first appearance of this kind enabled me to lead the case to a successful issue by anticipating treatment some hours before any other physical signs were present. The commencement of the process is usually, indeed always, introduced by a chill or rigor, followed immediately by a considerable rise in temperature. The chills are repeated at intervals, at times as regularly as in intermittent fever, at other times irregularly. The diagnosis of pyæmia is confirmed in proportion as the chills are regular or frequently repeated. Fever of a continued character appears, often having many of the characteristics of hectic; there is much mental disturbance—rarely an active delirium, but an apathetic or semi-comatose state; the face has a peculiar bronzed or muddy appearance; emaciation is considerable and rapid; urine is scanty, bowels inactive, skin dry and the teeth covered with sordes. The eyes look dull and lifeless, bed sores may appear, and the exhalations and breath have a peculiar sweetish, nauseous odor. So far the symptoms are common to many forms of asthenic fever, but more character-

istic ones are not wanting. There are visceral complications, early in the case, particularly in the liver, spleen, and lungs; later other organs may suffer, and post-mortem examination reveals numerous abscesses scattered through the substance of the parts involved. These collections of pus are called metastatic abscesses, and are the central symptoms of pyæmia, without which a diagnosis cannot be made, and with which the diagnosis is verified. Accordingly all those who recognize a difference between these surgical toxæmia have devoted much attention to the study of the etiology of this form of abscess. To show the difficulties under which the opposite party labor, let me call attention to the remarks of Dr. DELAFIELD (*Inter. Encyc. of Surgery*, I., p. 204), one of the latest writers on the subject: "But as KOCH says, the names pyæmia and septicæmia no longer express what was originally meant by them. For pyæmia does not arise, as was formerly supposed, from the entrance of pus into the blood-vessels, nor is septicæmia a putrefaction of the living blood. These have only remained in use as general names for a number of symptoms, which must probably belong to a series of different diseases. In this article the word pyæmia will be used as a general term to designate the entire group of cases." And again on page 207: "It is impossible to describe the symptoms and lesions of pyæmia, as we can those of a definite disease. The best that can be done is to enumerate the different conditions which are commonly spoken of under the name of pyæmia, and to describe the symptoms and lesions which belong to to each condition." The result of this attempt, as illustrated in the chapter from which the extracts have been made, has been to leave the student in a state of hopeless confusion, and which would well-nigh paralyze therapeutic efforts if more rational treatises were not obtainable. When the time arrives, as it is hoped it may, when our knowledge of drug action will extend from the most remote prodromal lesion to the fully developed malady, accuracy in our practice can only be obtained by possessing equally exact knowledge of morbid action. It ill becomes us, therefore, to ignorantly and unques-

tioningly, adopt all the teachings of the day, particularly when they are avowedly designed to simplify nosology by grouping allied conditions under a single name. It is *our* part to individualize morbid phenomena, to a far greater extent than has ever been the case hitherto. Let us, therefore, enquire at some length, the meaning and origin of metastatic abscess.

All observers recognize the fact that the first gross lesion, as regards the condition of the blood, is the formation of thrombus or clot in the veins. There is little question that this thrombus is due to two factors, first an increased coagulability of the blood, and second an excitant to such coagulation. The question of increased "fibriniferousness" of the blood is practically impossible of solution in the present state of knowledge. Some writers doubt if fibrine is a normal constituent of blood, a merely accidental ingredient. An objection to this theory, it seems to me, is found in the fact that blood coagulates readily under all circumstances, when drawn from healthy veins, the coagulation being due to the fibrine contained therein. What is the fibrine? Is it representative of tissue-making elements, or of retrograde metamorphosis? A suggestion of a plausible elucidation is found in the fact that blood increases in coagulability in proportion to the increase in the intensity of the inflammatory process. Inflammation representing a state of exaggerated waste, excessive production and deficient organization, the presumption is entertained by many of our pathologists, that fibrine is the result of post-perfection. Now inflammation, arising idiopathically, represents one of contrary states of the blood, poverty or plethora, and either state, whilst practically contradictory, furnishes the same elements favorable to coagulability. In the former we have plastic material which the forces of organization are inadequate to appropriate; in the latter, we have an excess of these elements beyond the need of the body. In either case there is, therefore, a preponderance of fibrine, and a condition of the blood favoring coagulation on proper incitement.

The coagulability being provided we have next to search

for the probable exciting cause. We find this three-fold: The introduction of a nucleus into the current of the circulation; anatomical factors relating to the arrangement and distribution of the vessels; and physiological abnormalities, particularly with reference to the phenomenon of circulation, as retardation, remittency, or some similar disturbing force.

There can be no doubt that the continuance or unusual energy of septicæmia may introduce into the blood particles of foreign material that act as a nucleus for coagulation, apart from any specific or septic character they may possess, solely in obedience to mechanical laws. Experiment has shown that such material is at once encapsulated by the fibrine of the blood, probably as a conservative process, but practically it enlarges the probabilities of thromballosis by increasing materially the size of the foreign body. Pus may, also be introduced into the blood-current and, without specificity, induce coagulation precisely as any foreign body would. Now it matters not whether we consider pus to be a product of the blood, a proliferation of connective-tissue corpuscles, or a return of formed tissue to the embryonic state; under each and all of these conditions—and they may all be accepted as parts of the whole truth of suppuration—the pathognomonic element of the pus is the cell, which has been quite conclusively shown to be a dead leucocyte. To repeat what has often been said, the corpuscular part of pus is not diagnostic until all amœboid properties are lost; as long as these continue, the cell, taken apart from any other characters of the mass in which it is found, and without knowledge of its source, is a leucocyte and nothing more. It is only when dead, spherical, granular, and perhaps fatty, that, under the above hypothetical conditions, the observer can unhesitatingly pronounce it a pus cell. Now this being true, such a cell is as much a foreign element in the blood as any other dead organic particle derived from without, and will become encapsulated and form a nucleus for a thrombus just as readily. Suppose, again, that the pus-cell is found to be intervascular, with no evidence of suppuration outside of the tissue of the vessel, as may occur in

suppurative phlebitis, how, we may ask, did it find entrance to the blood? It was formerly taught that the venous endothelium, the intima, furnished pus as a result of inflammation. Later we were told, by SIMON, CALLENDER, and others, that "the lining membrane of the veins rarely inflames and never suppurates." This is astonishing doctrine to come from those who yielded full credit to the teachings of COHNHEIM. *Any* vascular tissue can become inflamed, and suppuration is a normal sequence to inflammation. To make this stronger it can now be asserted that *all* tissue is vascular, and the blood comes into direct relation with every part of the organic body. The pus-cell in the current of the blood can be derived from either the endothelium, or the blood itself by an accidental destruction of the white corpuscle. From a consideration of these facts it seems to be a legitimate conclusion that the nucleus of the clot may be inter- or extra-vascular, both as regards character and source; that is, it may be entirely septic or a product of suppuration.

This brings us to the next point, the anatomical arrangement of the vessels as favoring coagulation. It has long been observed that with the heart as the center of the propelling force of the blood, there is a demand for some resistance to the force and rapidity of the current in some regions, and for a diminution of resistance at others. Thus the closer the vessels are to the source of power, the greater the demand for resistance; and the farther they are removed from that center the less resistance there must be. The realization is found in the arrangement of the angle at which collateral branches are given off from the main trunk; being at right-angles near the heart, the angle becoming more and more acute as the distance from the heart increases.

While this arrangement is admirable as long as the conditions of the blood and circulation are normal, when pyæmia or thromballosis sets in it becomes an element of danger. Conceive a current of blood flowing in a comparatively sluggish manner, as it must do in the peripheral veins, with its plasticity so abnormally increased that it seems, as it were, to be in

search for an excuse for coagulation, coming in contact with an impediment like the wedge-like form of the point of bifurcation in a vessel, as occasionally is found where a vein runs into a double one; even the valves are impediments. At once the excuse is found, and a layer of fibrine is deposited, continually added to from the constant stream of blood passing over it, until a clot is formed. Hence the focus of thrombus becomes a matter of moment.

Escaping this danger, the blood still being in the fibrinous condition essential to pyæmia, there is still a third way in which coagulation can occur, through physiological insufficiencies. Anything which retards the force or rapidity of the circulation must, on clearly understood physical principles, furnish the conditions for coagulation; thus shock, coma, and hæmorrhage will weaken or suspend the heart's action, playing an important part in causing pyæmia.

In some one or all of these ways, therefore, thrombosis occurs, and under any or all circumstances there can be no question of the vital or intrinsic origin of pyæmia. There is no question here of bacteria, or the influence of any organic forms from without. The process, from first to last, represents a species of morbid action in the true sense of the word.

I have now accounted for the formation of the clot as the initial lesion in pyæmia, and it is next to be enquired what relation multiple abscess has thereto. We must recognize the fact, in the first instance, that multiple abscess is not an invariable result of thrombus, whilst it is essential to the establishment of pyæmia. The clot may be of such a firm texture and perfect organization that the vessel is completely and permanently occluded. In consequence of this the vein may become obliterated, or abscess form on the distal side of the clot. When the latter, the clot may become gradually loosened, and either a channel formed for the passage of the blood, and thus the circulation becomes reëstablished, or the clot carried on further in the current of the blood. These are the most desirable terminations.

Again the suppuration may loosen the clot so that it is dis-

charged with the contents of the abscess. In other cases, and under favorable circumstances, the clot being small and unattached, it may be carried into some of the arteries, after its passage through the lungs, and ultimately induce embolism; of course the consequences now will depend upon the vessel plugged up. These, whilst among the rare and infrequent terminations of thrombosis, are not at all hypothetical, and may be considered on the whole, rather desirable. Should it be possible to definitely locate the clot, in a superficial vessel, the question would arise how should it be disposed of; by an attempt at fixation, or dispersion? Either disposition presents its peculiar dangers, but fixation seems to be rather more desirable, as dispersion may carry the fragments to regions in which the danger would be greater, and multiple abscess is not so liable to occur. But this is not strictly within the line of our enquiry, as it is pyæmia and not simple thrombosis we are studying.

The clot is usually found at the point of division of a vein, oftener, perhaps, at the point of union between a deep and a superficial vessel, lying across what is practically a septum. The clot acts as a nucleus for fresh accessions, chiefly as the calibre of the vessel is correspondingly diminishing and the rapidity of the flow of blood retarded. Should the lumen of the vessel become entirely filled, the clot becomes lamellated in arrangement, and quite regularly organized. If one of the accidents mentioned above does not now intervene, the clot begins to soften in the centre, extending towards the proximal periphery, when the particles thus thrown off are carried along in the current of the blood acting as nuclei for fresh coagulæ wherever lodging.

In the ordinary form, however, the clot does not become organized, is loose and friable in texture, hanging over into each vessel, particles continually breaking off and moving along in the blood current. The particles furnished by the original thrombus, under either circumstance, are carried along from the smaller vessels to the larger, passing ultimately into the lungs or liver with the stream of venous blood, and either lodging in the minute vessels in the organs, or passing

out again into the current of the arterial blood. When the latter, embolism is quite sure to occur when the smaller arteries are reached, and the characteristic phenomena are produced. When the former occurs, which is the natural pyæmic history, the point of lodgment becomes the focus for localized inflammation, and minute abscesses form, which at once endangers the integrity of contiguous parts and furnishes innumerable nuclei for new thrombi.

This represents in brief a history of the origin and course of a typical case of pyæmia. The most superficial reader and student can scarcely fail to note the wide dissimilarity from septicæmia. In short, apart from the fact that pyæmia often appears as a sequel to septicæmia (from the nuclei of the thrombus essential to the former being provided by the latter), apart from this it is difficult to establish any nosological relationship. We found septicæmia, in a former paragraph, to be due to vital changes without necessary dependence upon external conditions and circumstances, and the same vital considerations pertaining to the etiology of pyæmia have now been shown. Yet the conditions of one are only secondarily related or similar to the other, and I am forced to conclude that those who speak of them as a unit do so from an unfortunate desire to simplify nosology owing to a want of a proper appreciation of the requirements of pathology as related to therapeutics.

We find, also, that pyæmia may not, at all times, be considered primarily a species of morbid action. Traumatism, by inducing hæmorrhage, feeble circulation, and weakened heart's action fills all the indications. The resulting suppuration is only an unfortunate conservatism of nature which blindly seeks to remove impediments to her operations by thrusting them out of the way in the speediest manner possible. With a splinter in the flesh this process is harmless and proper; with a thrombus in the lungs or liver, when a deterioration of vital powers is superadded from traumatism, it becomes dangerous and wrong. The two conditions are alike; the difference in result and significance being solely on account of location, which converts a natural conservative process into a

threatening morbid one. It is not seldom that we find this faint line of demarcation between physiology and pathology. The first and characteristic morbid feature in pyæmia, is the increased fibriniferous quality of the blood; after this the further manifestations are in obedience to patent natural laws.

The following short comparison will serve to emphasize these points of difference, and effectually prove duality in these forms of toxæmia.

SEPTICÆMIA.	PYÆMIA.
Chronic in character.	Acute in character.
Local causes primarily.	Primarily systemic.
Essentially traumatic.	May be idiopathic.
Lymphatic absorption the prime factor.	Venous thrombosis the essential lesion.
Regular and moderate febrile heat.	Irregular and extreme changes in temperature.
No regular chills.	Chills frequent or regular.
No multiple abscess.	Multiple abscess.

Treatment.—Naturally the treatment is divided into hygienic and medicinal. Under the former head nutrition occupies the first place, both as prophylactic and curative. By affording this the conditions of pyæmia are averted or modified, and later the consequences may be more easily repaired. In fact, in many cases, exhaustion rather than any specificity in the morbid action is responsible for death. Nutrition does not include what are particularly known as “tonics,” yet mild stimulation is of the greatest value. It is not my purpose to suggest any particular form or variety of nutriment, as each case must become, to a considerable extent, a “law unto itself.” Milk, however, is of the first value, usually, to which may be added a small quantity of lime water. Palatability and readiness of assimilation must be the controlling considerations.

Remedies must be selected with the greatest care. Unfortunately many of our text books are written with such want of accuracy, as far so nosology is concerned, that they are often worse than useless as guides, even dangerously misleading. Although among the humbler in the brotherhood of

writers, I acknowledge guilt in my own share in this, often, it may be said in extenuation, from copying the language of others in whom I then had confidence. For instance, *Lach.* is spoken of in all our text-books as a prominent remedy in pyæmia; HUGHES, I think, was the first to recommend it in this connection. It may be that the *secondary* effects of serpent venom show increased plasticity of the blood, but it is well known that the primary effect is a remarkable fluidity, loss of coagulability. This would rather make it a remedy for septicæmia, and the error has arisen, if it is an error—from a failure to distinguish between the two conditions.

Arsenic has done me good service in one or two instances, and from a consideration of their known action, *Arnica*, *Bell.*, *Merc.*, and *Ham.*, with perhaps *Rhus*, should be more or less useful.

This concludes a study of inflammation with the sequelæ and modifications that have the character of *destructive* morbid action. Before taking up morbid processes that are *constructive* in their essential characteristics, attention must be invited to the lymphatic, vascular, and nervous systems, all of which will be found closely related to causation in many of these forms of disease.

XIII.—PATHOLOGY OF THE LYMPHATICS

WHILST true of all tissues and parts, to a certain extent, the lymphatic system rarely originates morbid action. Whenever functional changes are observed in these vessels, it is only as concomitant upon morbid action originating elsewhere, whilst, at the same time, they are the media through which irritants are conveyed from one point to another, and from the periphery to the center. Thus in syphilis, gonorrhœa, vaccinia, carcinoma, and a host of other diseases, the peculiar morbid principle is conveyed by the absorbents from the point of initial lesion throughout the body. Acting so frequently as mere media, and without manifesting any yielding to the morbid agent themselves, they occupy an anomalous and interesting position in surgical pathology, of which our want of accurate knowledge forbids thorough and competent study. In the few instances in which morbid phenomena seem to originate in this system, we are still far from enjoying a satisfactory knowledge of the *modus operandi*. The brief space we are enabled to give to this subject, therefore, will be devoted to a study of inflammation of the lymphatic vessels and glands, and hypertrophy of the glands.

INFLAMMATION OF THE LYMPHATICS.

Angeioleucitis, the term used to distinguish inflammation of the vessels from that of the glands (*adenitis*), presents some peculiarities over the same process in other structures that well repays study. The chief features are, rapidity of development, moving in the course of the afferent vessels, and

rarely passing the first gland it reaches, excepting in the case of some specific forms of disease.

The Causes of lymphatic inflammation are often very obscure, even when evidently traumatic; many injuries, perhaps the majority of them, pass through all the periods of repair without any complication of this character. I am of the opinion that it is the absorption of septic material that oftener produces the complication, at least such has been the case in the few examples I have seen. Exposure to cold, is a frequent cause, as some think from an unrecognized change in the contents of the vessels. In other cases, and perhaps the majority of instances, specific diseases, or the introduction of an irritant locally is the undoubted cause.

The irritant once operative the subsequent manifestations are very rapid, so much so that the only analogue is furnished by the rapidity with which conjunctivitis follows irritation from a foreign body in the eye. Mr. MOORE (HOLMES' *Syst. Surg.*, III., 330) mentions a case in which the prick of a perfectly clean needle, set up an acute lymphatic inflammation, with pain and swelling of the glands, which ran its course and subsided within the "space of a few minutes." In the majority of instances the attack is evanescent, not as markedly so as the above, and leaves little behind it in the way of permanent change in the tissues.

The Symptoms are characteristic, when the superficial vessels are involved; when inflammation occurs in the deeper structures it is doubtful if a diagnosis can be made, at least with any approach to certainty. As will appear later, glandular enlargement is supposed to be invariably indicative of lymphatic inflammation; hence the swelling of a gland with no signs of superficial angeioleucitis, would point to an irritation of the deeper vessels. Starting from the point of injury, or irritation, the skin will be marked by red lines, running in the course of the lymphatic vessels, rarely extending above the nearest joint. Thus in the hand, the lines will terminate in the wrist; higher up they may pass to the elbow or axilla; it is said they never pass beyond the latter point, but this

must not be construed to mean that the liability to inflammation of the vessels does not extend beyond this region; the vessels here pass deeper, and cease to be superficial. The vessels can rarely be *felt*, by tracing them with the finger, neither are they sensitive to such pressure. The part is swollen more or less, perhaps œdematous; the temperature slightly elevated; and there may be stiffness on motion. The inflammation may pass away, in a very short time particularly if the glands are involved, in which case they seem to take all the burden upon themselves, relieving completely the afferent vessels. Otherwise, which is of very rare occurrence, the inflammation will run through the usual stages, and terminate as in other regions. When the vessel is destroyed, either by sloughing or ulceration, or agglutination of the walls, the lymph will collect at the point of occlusion, distending the tube like a cyst until, finally, another channel is found, or a perforation will occur, the lymph being poured out. In one case, recorded in a journal now mislaid, the lymph was discharged upon the cutaneous surface, a lymphatic fistula being formed, which remained in existence many years. In other cases, a communication has occurred between the lacteal cyst and the kidney, bladder, or some urinary appendage, and chyle discharged in the urine. In still other instances, two of which have come under my notice, the chyle has been poured out into the abdominal cavity, producing what is known as *ascites chylosus*. Under any of these circumstances the condition may be considered as one of fistula. The effects are entirely dependent upon the location of the fistula. Thus, if the thoracic duct be occluded particularly high up, death must ensue, sooner or later. When in less important vessels, the effects are entirely dependent upon the loss of nutrition.

There are other results, however, of occlusion of a lymphatic vessel. The contents of a cyst may become inspissated, and either a cretaceous or lardaceous degeneration occur, perhaps remain as a permanent tumor, and perhaps undergo disintegration and suppuration.

The inflammation, it has been said, does not often extend

beyond the nearest gland. This is unquestionably true of non-specific affections, or traumatic sequelæ; but not so in specific contagion, particularly syphilis and carcinoma, when a whole chain of glands becomes affected. I presume an explanation may be found in a consideration of the significance of glandular swelling.

Traumatism can only change the fluids of the body by adding broken down tissue, or some chemical product of decomposition. It cannot, in other words, add any *specific* toxic influence. The glands are under these circumstances engaged in the act of elimination, an act that is perfectly consistent with their normal function. They enlarge because the work required of them is increased. In rare instances the work will be too great for the gland nearest the point of injury, and others beyond it, will become enlarged. If the efforts of nature are successful, the swelling will gradually disappear, and all irritation and inflammatory symptoms pass away. If unsuccessful, suppuration will ensue, an abscess form, and the material *causa morbi* may be thrown out in the discharges.

In the case of specific disease, however, the conditions are widely different. Here it is not an elimination that is going on, but an absorption. The formative elements passing through the absorbents are charged with a species of energy, rather than a normal product of decomposition; a force that has the peculiar power of imparting its characteristic properties to every bioplast with which it comes into contact. The lymph now does not convey a passive septic material, going wherever carried by the fluid in which it floats, but an active poison, which propagates itself and extends its operations by processes vital in character, and only follows the lymph channels because they are the most convenient for the purpose. We thus see one gland after another enlarged until a chain of them is formed, not inflamed, but enlarged from hyper-activity. Occasionally, from causes not understood, the morbid principle or force, does not extend beyond the first gland affected, but becomes localized, induces active inflammation, suppurates and is thrown out in the discharges. This is almost uniformly

true in gonorrhœa and chancroid; has occasionally occurred in carcinoma, and with equal rarity in syphilis. The explanation may be, in a difference in kind *and* amount of virus. Thus in carcinoma and syphilis, whilst existing tissue is destroyed by contact with the new tissue, the morbid process *creates*; laying down of tissue is the peculiarly pathognomonic feature of these diseases. The tendency is both to disintegrate, and to build up, albeit the new tissue is always of a heterogeneous character; still being a formative process, and vital, the glands assist in the act, as it were under coercion. There is no disintegrated tissue to expel, but tissue-forming forces to assist. Now it is possible, for the primary impression in either case, to be so profound, or acute, that the effects are devitalizing and the result is more like that of non-specific irritation. Hence we have occasional elimination of specific products, even formed carcinomatous tumors.

In the case of gonorrhœa and chancroid, as well as erysipelas and some other forms of specific disease, whilst the specificity is as marked as in syphilis or carcinoma, the glands if affected at all, present the same characters as in non-specific irritation. This is easily accounted for: We know that while the two latter diseases are characterized by the formation of new tissue, the former are notably destructive. In the one case we find only *debris* of the parts affected, in the discharges; in the other, we find little or no detritus, but new formative elements, representing the plastic excess. Hence the discharge from syphilitic and carcinomatous affections, is usually scanty; in gonorrhœa and chancroid profuse. The inference is easy, therefore, that the irritation is confined to one, or a very few glands, in the latter instances, as in the case of non-specific adenitis, because the conditions are similar, *viz.*, an elimination of dead tissue.

What has been gone over above, applies particularly to acute inflammation. When the lymphatics are the subject of chronic inflammation, the symptoms differ somewhat, as in the case of chronic inflammation in general, showing an enduring enlargement, both of the vessels and the glands, and a ten-

dency to unhealthy suppuration. The typical and familiar form of chronic lymphangitis is in scrofulous affections. The chapter on *Inflammation* has already given a reasonably graphic account of chronic inflammation in general, so much so that the same principles applied in the present instances will render unnecessary a minute account of chronic angieoleucitis.

The Treatment is to be based upon the cause and nature of the inflammation, with some reference to location. Thus in traumatic or non-specific inflammation, we are to attempt a speedy cure without suppuration. In specific conditions, on the contrary, suppuration is the most desirable termination. In chronic cases, again, suppuration must be avoided if possible, yet if it is inevitable, an early discharge of the pus must be secured, and the process held within as narrow bounds as possible. The treatment in specific cases will be given under the appropriate heading, being entirely subordinate to the general condition. In acute, and even chronic cases, it will rarely occur that there will be any necessity for other than medicinal treatment, unless suppuration occurs. In such an event, early evacuation is the proper practice, bearing in mind that there are occasions where the indications vary as to the propriety of promoting or aborting the formation of an abscess.

Aconite is a remedy of the first importance in acute traumatic cases, if non-specific. The paucity of symptoms renders the fact of its being acute the only leading indication.

Arsenicum takes the first rank in septic cases, where the characteristic symptoms, as thirst for small quantities, restlessness, and internal heat are present. The skin is œdematous, but dry and parchment-like.

Baryta carb. is indicated when the glands are prominently involved in chronic cases; there is little tendency to suppuration, the gland remains hard, though painless, for a long time, and if pus forms, it is in small quantities and slowly produced; pus is prone to become cretaceous. There is little if any inflammation from first to last.

Belladonna is indicated in acute cases, of a high grade of inflammation; glands much swollen, red and inflamed, with

throbbing pain, pus forming of a thick yellow character. The lymphatics can be traced by bright scarlet lines; some puffiness of the part, but scarcely amounting to an œdema.

Calcareæ carb. is an invaluable remedy in chronic cases, in scrofulous subjects particularly, with glandular enlargements increasing very slowly, suppurating slowly, and especially when the cold, damp feet, sweating of the head during sleep, and other well-known symptoms are present.

China has been useful in some cases, with a bare suspicion of septicæmia, occurring in those who have been exhausted by long confinement, or sustained great loss of blood. The symptoms closely resemble *Calcareæ*, but are not indicative of deep-seated dyscrasia, as is the case with that remedy.

Carbo veg. has followed well after *Arsenic*, or has been useful when that remedy fails, when the exhaustion is extreme, demanding fanning to keep up respiration. The respiration is sighing, there is intense burning in the interior of the part, but not so diffused as is described under *Arsenic*; more circumscribed, "as if from a live coal."

Dulcamara has been spoken of as useful in acute attacks from wetting, particularly if the glands are painfully swollen, and the attacks are subsequently renewed whenever the patient gets wet, or the weather becomes rainy or damp.

Hepar is an invaluable remedy when there is a strong disposition to suppuration, and it is desirable to hasten the process. Given in frequently repeated doses, it will shortly induce pointing, and hasten the formation of the abscess painlessly.

Lachesis is a potent remedy in septic cases in which there is great prostration, mental and physical; there is usually a marked pyæmic tendency. There is none of the restlessness or heat of *Arsenic*, apathy and lowered temperature being the prevailing characteristics.

Mercurius (vivus) has long enjoyed a well-founded reputation for aborting glandular abscess in *Adenitis*, both acute and chronic. For this reason it must be very carefully used, as it is so closely indicated in venereal diseases that we may do harm by arresting suppuration when every care should be

taken to promote it. The septic indications for this remedy are extreme weakness, with tendency to sweat at any motion, or on very slight provocation.

Rhus tox. is the chief remedy where typhoid symptoms appear, with tendency to erysipelas; it has done good service in pyæmia, under these circumstance, being chiefly indicated when there is great bodily restlessness, not so much from nervousness, as because motion relieves what pain there may be.

Sulphur is similarly indicated, particularly in strumous cases, especially if the part is erythematous, and in spite of the heat cold washing cannot be borne.

Hypertrophy of the Lymphatic Glands needs little mention in addition to what will be said under *Tumors*. It is due, when not specific, to a chronic inflammation of the gland, and plastic organization. In cases of specific enlargement there is more than a simple hypertrophy, the new tissue, always heterologous, ultimately taking the place of the natural tissue of the part. A peculiar feature of the non-specific forms, as I have observed it, is that in proportion as the gland increases in size, its functional activity correspondingly diminishes. The primary enlargement, when the case is yet acute, induces, and in fact is due to increased functional activity; but in proportion as the effusion becomes organized, and the enlargement becomes permanent, functional life becomes less and less, and may cease entirely.

Treatment.—There may be instances, in which the growth of the gland is immense, and if life is not endangered important parts are compressed by it, when excision would be allowable; but none such have occurred in my practice. In very few cases will our remedies fail, if given in strict accordance with the indications. *Iodine*, which some still employ, will *not* cure, as the gland may be destroyed by atrophy, if any impression is made. A *cure* can only be claimed when the structural and functional integrity is restored; a simple subsidence of the swelling, with no restoration of function, can only, at the best, be considered a negative success.

Of course what has been said applies entirely to hyper-

trophy non-specific in character. In specific cases the destruction of the gland by suppuration is the first indication; failing in this, extirpation may be admissible if there is reasonable certainty that the morbid action is localized. Whilst we have many well-authenticated instances of a cure with remedies of hypertrophy from specific infection yet they seem to be rather the exception than the rule; in view of the great interests often at stake, and the difficulty of securing clinical experiment, it must be very long ere we can hope to consider the condition perfectly amenable to the internal administration of remedies.

Silicea, *Baryta c.*, *Calc. c.*, and *Merc. viv.* are the remedies oftener indicated, and their administration must be upon purely general symptomatic indications, not necessary to transfer from the *Materia Medica* at this place.

Lymphangiectasis and Lymphoragia:—Occasionally from trauma, or acquired from other causes, but more frequently existing congenitally, cases are seen in which the lymphatics are enlarged, chiefly in the form of pouches, somewhat like varix, the contents being thrown out in jets, in some instances, and in others trickling out more or less constantly. This condition is called *lymphoragia*, and while distinguished by these peculiar and pathognomonic symptoms, represents the first stage of a much more serious matter, *viz.*, a dense varicose condition of the vessels, forming sometimes immense tumor-like enlargement of the part, known as *lymphangiectasis*. What might well be considered two distinct forms of morbid action, if a specimen of each were seen in a different individual, represent simply an early and a late stage of the same condition, to be considered under one head. Inasmuch as I have seen but two cases, I shall be forced to borrow my description from another. Dr. D. C. BUSEY (*Holmes' Surg.*, Amer. Ed., Vol. II, p. 473), in an elaborate article on this topic, gives a number of cases, one of which I quote to illustrate the vesicular, as well the hypertrophic, or tumor form: "F. N., aged 19 years. When one year old the right thigh was larger than the left, more or less so according to the use of

the limb. When four years of age, after a short walk, without unusual exertion, the right thigh was observed to be double the size of the left. The swelling extended from the groin to the knee, was not sensitive or painful, and was covered with normal colored skin. It remained, now larger, now smaller, but occasioned no inconvenience. After a time the skin upon the anterior and inner aspect, and toward the scrotum thinned in several places, forming small shining spots slightly elevated, which ruptured spontaneously and discharged a yellowish-white, opalescent, somewhat tenacious fluid, which, upon exposure to air, coagulated into a jelly-like mass. When the rupture occurred while walking, the fluid would jet out for several feet, and sometimes a pint or more was lost, which would be followed by a sense of great exhaustion, paleness, and languor. These discharges occurred three or five times during a year, and continued for thirteen years, during which time the swelling extended to the leg and foot and similarly thinned spots formed upon the plantar surface and between the toes, but none appeared upon the leg. When ten years old, without discoverable cause, violent pains around the right trochanter, extending across the right gluteal region and down the thigh and leg supervened. At the same time the extremity from the groin to the sole of the foot began to enlarge more rapidly, the thigh attained the circumference of the body of an adult, and the foot and leg increased in proportion. Subsequently a large abscess formed in the gluteal region, which after a time ruptured and discharged during several months large quantities of pus, and after it healed the thinned spots developed into transparent vesicles the size of peas, containing a clear liquid; the integument thickened and felt firmer, the epidermis roughened, the furrows deepened, and the papillæ enlarged. The limb enlarged throughout its whole length, and numerous vesicles formed upon the anterior surface of the thigh, and upwards towards the groin and scrotum, reaching one and a half lines in height, transparent, and filled with watery fluid. The contained fluid could be pressed back, but immediately returned upon the

removal of the pressure. One of the larger cysts was opened, and the evacuated fluid proved, on microscopic examination, to be lymph. Finally pleuritis set in and the patient died.

"Autopsy:—Skin hypertrophic throughout all its layers; more so upon the anterior and inner part of the femur. Throughout the hypertrophied portion was a large meshy net of dilated lymph-vessels; some of which had attained the size of goose-quills. The most superficial vessels could be traced into the cysts projecting from the skin, and they were ampulla-like dilatations of the extreme ends of these vessels, with thinning of their walls. Upon the lymphatic trunks situated outside of this extremity, nothing abnormal could be discovered. The lumbar muscles were atrophied. The connective-tissue of the lowest portion of the leg was infiltrated with pus, the articular cartilage of the lower end of the tibia was destroyed, the ends of the bones carious, the ligaments destroyed, tarsal bones carious. Tubercular deposits in both lungs, beginning to soften; small caverns in left lung; tubercular deposits in liver, spleen, and other abdominal organs."

One of the cases I saw, was in the practice of Dr. FOSTER, of Detroit, Mich., who called me in consultation only a short time before death. No history could be obtained, but the objective symptoms at that time, were very like elephantiasis. The right extremity throughout its whole extent, the left as far as the knee, the scrotum, and the whole of the abdomen were enormously swollen; dark color, a reddish brown—and very hard. On deep pressure with the finger, however, there was pitting, slowly filling up, and as this excluded elephantiasis, I was not able, at that time, to make a diagnosis. At the autopsy, assisted by Drs. OLIN and McLAREN, the integument was found enormously hypertrophied, as described above, large quantities of lymph flowing out of the incisions. The abdomen was filled with chyle (*ascites chylosus*), and the appearances were precisely as given in the case quoted from Dr. BUSEY.

The cases quoted give a sufficiently accurate account of the semeiology, and nothing need be added. There is much varia-

tion in the symptoms in different cases as far as external expression is concerned; in some there is thickening of the skin; in others not; in some there is a distinct varicose condition of the vessels, sometimes associated with a similar condition of the veins, in which event the diagnosis is very obscure. In all, however, there are certain symptoms that may be said to be pathognomonic, particularly the weakness and debility, far beyond what would be present in simple varix of the veins.

The *causes* are not, I may say, understood. Nearly all writers, even in the most carefully written and elaborate works, are content to refer it to an occlusion of the vessels, perhaps occurring accidentally, in some cases congenital. They seem to forget, that, as will be shown shortly, these vessels are frequently divided, or injured in connection with injuries to the tissues in which they are found, and such results as have been described are exceedingly rare. That there is a hypertrophic diathesis—if the word is admissible—is very evident; whence it arises, it is, at present, impossible to divine. Very unwillingly I am compelled to decline to argue this question further, as after patient study I am utterly unable to form any theory of causation that seems reasonable. One case in my experience was due to stricture of the thoracic duct, from extension of scirrhus of the pancreas.

As little can be said of *Treatment*. I am not aware that a case has ever been cured, by any means, local or general; strapping, compression with collodion, astringents, and the whole armory of old-school practice have been employed, and all alike have failed. In our own literature I cannot find a single case, and considering the pathological anatomy I do not see how anything can be done, particularly when the condition is well advanced.

Injuries of the Lymphatics.—The lymphatics are necessarily wounded very frequently, and rarely, if ever, attract any attention as far as results are concerned. In fact I am not aware that they enter into the calculations in planning operations in the exterior of the body, unless it be in the supra-

clavicular fossa on the left side, where a deep dissection might endanger the thoracic duct. They seem to heal with unusual readiness, or if they become occluded no ill-effects have been observed. In very exceptional cases, however, hardly enough in number to warrant consideration, fistulæ have formed through which there is a slight exudation of lymph. I am not aware that mere traumatism, apart from any constitutional or congenital defect, has ever induced a serious disease of the lymphatics.

XIV.—PATHOLOGY OF THE BLOOD-VESSELS

THE blood-vessels, arteries, veins, and capillaries, exhibit changes in structure that not only indicate local and accidental occurrences, but are frequently expressions of widely distributed morbid action. The consequences, depending upon extent and kind of degeneration, may be entirely local, or threaten life. It is doubtless true that many cases of serious and profound alteration in the structure of blood-vessels cannot be recognized during life, and the mere therapist might find little of interest in the discussion, were it not for the fact, that many recognizable phases of morbid action give timely notice of threatened danger. Thus in spontaneous aneurism, it is to be inferred that some degenerative change in the blood-vessels has commenced, and its further extension may be prevented. So in calcification of vessels, it might serve a useful purpose to know that rupture of a cerebral vessel was among the possibilities of the future. In an elementary work like the present, it is impossible, and even undesirable to exhaust the subjects thus opened up; the principal abnormalities will alone be discussed.

We find that the commoner changes in the vessels are chiefly trophic, it is true, but in many cases there is some constructive or degenerative morbid action; there may be also a metaplastic process operative, which, however, does not call for extended or separate consideration, as the consequences and general characters are those of hypertrophy. These questions can be more intelligently presented, if a distinction is made between the arteries and the veins, for although many of the forms of morbid action are common to both, yet the consequences are very different.

ATROPHY OF BLOOD-VESSELS.

Atrophy of blood-vessels, by which is meant a diminution in the vessel, in every way, lessened calibre, and attenuated walls—is sometimes observed as a concomitant of general marasmus. More frequently it is due to local influences, traumatic in character, such as would have the effect to cut off circulation in certain territories. Typical instances of atrophy are observed after amputations, or operations that divide arteries, the collateral circulation having the effect to so change the distribution of blood in the part, that certain vessels lose their importance. Such cases, however, are not at all pathological; pure atrophy is such as would accompany or be responsible for symptomatic ischæmia. There are cases in which a thinning by absorption of one or more of the coats of a vessel occurs, either from inflammation, or pressure from contiguous morbid growths, or hypertrophied parts, even an over-stretching from rapidly established swelling. There are others in which the vessels of a part partake in a morbid action, such as diphtheria, tuberculosis and the like, and undergo necrosis, or even a more subtle form of disorganization, *necrobiosis*. In most of these varieties of atrophy, the amount of blood passing through a vessel is proportionately diminished, so that nothing follows beyond loss of blood to the tissues normally supplied. Where there is compensating collateral circulation, there is little if any loss, and no tissue changes are observable; where this is not the case, ulceration or gangrene is a natural result. In cases where there is atrophy of the coats, one or all, without diminished blood-volume or narrowing of the lumen, aneurism, or rupture is to be feared.

HYPERTROPHY OF BLOOD-VESSELS.

Hypertrophy is perhaps more common than atrophy, and to some extent has a closer relation to pathology. There is an augmented calibre, and increased thickness of the walls, very frequently with increased length as well, shown by the convoluted form into which it is thrown. Increased tension, as

occurs in Bright's disease, is the exciting cause for hypertrophy, but it may exist, in a somewhat modified form, as a result of a mild attack of inflammation, with plastic exudation. The anastomotic aneurism is an illustration of hypertrophy. The conditions giving rise to the increase of tension are generally some interruption in the circulation, as a ligature, or compression of a vessel from a tumor, or the like; in the latter case it is not unusual to find the distal part of a hypertrophied vessel atrophied, the same cause, an obstructed circulation, giving rise to the two conditions.

ARTERITIS.

Inflammation of an artery will nearly always be responsible for the morbid changes with which we have to do. *Arteritis* is a term used to describe an inflammation of the whole substance of the arterial coats; when the internal coat (*intima*) is alone involved, it is called *endarteritis*; that of the middle coat (*media*) *mesarteritis*; when the external coat (*adventitia*) is invaded, it is called *peri-arteritis*. From the fact that certain results follow inflammation of one or the other tunics, as well as that post-mortem examination shows such to be the case—we know that inflammation may be confined to one of the tunics, or at least originate therein, and pass to others, or involve the whole structure secondarily. In practice it is possible, sometimes easy, to diagnosticate an arteritis, but unfortunately it is not always possible to determine in which tunic the inflammation originates, and thereby have early information of threatened danger.

As to *causation* arteritis may arise from traumatism, in which case it is not an uncomplicated lesion; or it may be symptomatic, partaking in an inflammation of parts with which the artery has close relation; or it may be *idiopathic*, arising from causes within itself, or some determining factor within the blood.

The *results* are directly related to the cause. Thus in traumatic cases, resolution must be the rule, and unless there is some actual injury to the vessel, such as a laceration or

severe contusion—function should be restored. In symptomatic cases, much depends upon the character of the associated malady, whether specific or otherwise. The same remarks apply to the idiopathic class, but from the nature of the causation there is much greater liability to permanent injury to the vessel. The general characters of an arteritis are as follows: The occurrence of inflammation, it will be remembered, establishes a certain group of symptoms, swelling being one of the most prominent. It matters not in which tunic the process commences, the extension must be away from the most resisting tissue, and be greatest in the most vascular, or that of the loosest texture. It matters little, therefore, which of the arterial coats originates the inflammation, the inner and middle must be more swollen than the outer, with the result that the lumen of the vessel is correspondingly encroached upon, and the passage of the blood impeded. In extreme cases the lumen may be entirely closed, the circulation completely arrested, and the vessel destroyed. Should the vessel be a large one, the parts it supplies may undergo mortification, unless collateral circulation is quickly established; if one of lesser magnitude, ulceration is to be feared.

The terminations of the inflammation are as in other tissues; hence suppuration may occur, or the vessel perforated by ulceration; in severe cases the more common termination is permanent occlusion, with atrophy below and hypertrophy above the focus, the atrophy proceeding to conversion of that portion of the vessel into a fibrous cord, as occurs after ligature. When perforation ensues, it may be confined to one or two coats resulting in *aneurysm*, or extend through them all, and set up a hæmatoma or *false aneurysm*. In other cases, as will be shown later, some degenerative process may be established, as calcification, sclerosis, and fatty degeneration. There is still another consequence, and one of quite frequent occurrence, *viz.*, *embolism*. The lesion to the intima, the narrowed lumen, and the retarded circulation, furnish all the conditions for coagulation, or *thrombosis*. A clot may form, become detached,

or portions of it, carried along for a distance and lodge, plugging up the vessel, and thus set up what is called *embolism*. The consequences now depend upon the location, as a matter of course, and do not concern us at present.

The Symptoms are not obscure when the vessel is superficial. The first indication, usually, is a sudden pain, obscure in character, and diffused. It rapidly increases in intensity and becomes localized in the course of the vessel; the extremity becomes more or less swollen, hot and red; if an extremity is the seat, it is flexed, the sufferings being increased when it is straightened. The pulse below the focus of inflammation is wiry and hard, above full and strong; the vessel is very sensitive to touch and pressure. Later, the pulse is weak, perhaps quite imperceptible, the temperature is lowered, and the color changed. If collateral circulation is established these symptoms gradually improve; if not they may pass over into those of gangrene. There is usually considerable œdema, particularly on the distal side. Should embolism occur, it will be announced by a sudden pain, "like an electric shock," with rigor, and cessation of pulsation below the point of lodgment. The distinguishing features are pathognomonic: The pain in the course of the vessel, the alterations in pulsation, and the swelling or œdema of the part evidently not due to inflammation of the tissues.

The Treatment of arteritis, without any of the complications noted above, is quite simple. In the early stages *Aconite* is alone indicated, as a rule; later *Belladonna* is the most prominent remedy. Other remedies may be needed, but the symptoms are so unvarying, that the number is very few. They will be those already mentioned under *Inflammation*. As adjuvants warm applications, and an easy position for the part are all that seem called for, unless embolism occurs. In this case, if the embolism is at the seat of inflammation, it has been advised to attempt breaking it up, by *massage*. There are objections to this practice, one of them being the aggravation of the existing inflammation; the other the dispersion of the clot threatening distant embolism, perhaps multiple,

and in less desirable localities. Should the vessel be an important one, and collateral circulation not promptly secured, breaking up the thrombus may be imperatively demanded, in spite of the risks thereby incurred. The prominent indication, however, is to establish collateral circulation as soon as possible. In dispersed or distant embolism, if the spot can be reached, massage is a good practice, as the clot being broken into small pieces, if lodgment does occur at a distance, it will be in smaller, and presumably less important vessels. Where *massage* is impossible, *Arnica* must be given, in the hope that the clot will be absorbed, although too much must not be expected. *Secale* has been used with success, on purely experimental indications, but *Arnica* seems to be the most reliable agent.

PHLEBITIS.

Phlebitis is an inflammation of the veins, like arteritis being traumatic, symptomatic, or idiopathic. The symptoms, as a rule, are not so urgent, as in arteritis, but the consequences are frequently exceedingly grave. When deep vessels, of some magnitude are inflamed, the symptoms are very similar to those of arteritis, with the exception of the changes in the pulse; there is more œdema, and less heat of the part. In the case of superficial veins, the diagnosis is comparatively easy. The veins are swollen, hard, hot, painful, and œdema is marked. The books give a large number of varieties of the disease, classified with reference to extent, tissues affected, natural history, and terminations; as a matter of fact the whole question may be considered under three heads, relating entirely to complications and terminations: Ephemeral, adhesive, and suppurative.

Ephemeral Phlebitis would represent the milder types, in which resolution occurs leaving the parts as they were before the attack, perhaps with some thickening of the coats of the vessel, but nothing notable in the way of lost or modified function.

Adhesive Phlebitis represents an inflammation of a higher

grade of intensity, in which there is plastic exudate sufficient to obliterate the vessel by adhesion of opposing surfaces of the inner coat. This, of course, obliterates the vein, but the consequences are rarely serious, as collateral circulation is readily established.

Suppurative Phlebitis is where the process terminates in suppuration, the pus being in the vessel, or external to it, in the sheath. As a rule the suppurative form is developed from the adhesive, so that the order of intensity or gravity, would be in the order here given. It will serve a good purpose to consider a bad case as passing through these three stages, although a given case may develop only through one or two of them. In the ephemeral form, as already said, the vessel may be left as the inflammation found it, slightly thicker walls perhaps, but the blood may and frequently does undergo the most important changes. Thrombus is formed, either occluding the vessel completely, and leading to the adhesive or suppurative forms, or else breaking up, and distributing its fragments throughout the body, probably resulting in embolism in various places, chiefly in the liver or lungs. If the case goes on to suppuration, pyæmia is almost a certainty, whether the pus be extra- or intra-vascular.

The Treatment is necessarily to be determined by the kind or grade of inflammation. In the simpler ephemeral forms *Aconite* will be needed. In the more severe types, in which obliteration of the vein seems threatened, and yet there are no signs of suppuration, *Rhus tox.* is prominently indicated. When suppuration is evident, *Arsenic* or *Lachesis* will be called for. There are cases in which *Nux vomica* or *Hamamelis* will be useful. The former when the course of the case is sub-acute or chronic, the vein being thickened and firm; the latter when the vein feels thinned, and dilated, "pouch-like."

DEGENERATION OF BLOOD-VESSELS.

Usually as a result of inflammation, but in exceptional instances from unknown causes, the tunics of blood-vessels

undergo degenerative changes. Probably in the majority of cases the first step is a deposit, which fails to organize in a normal manner. The more frequent of these degenerative processes are given below, not so much from any therapeutic interest, as from the fact that they are many of them forerunners of one of the most serious accidents that can befall a human being; *viz.*, *aneurysm*.

Fatty Degeneration is oftener found in the inner and middle coats, rarely extending to the adventitia, following a chronic inflammation. It commences in a fatty degeneration of the cells, which become filled with oil-globules; at first the deposits are between the muscular or elastic fibres, gradually penetrating the sarcolemma, until later the proper tissue has disappeared, and masses of fat occupy its place. In the early stages the changes are not apparent to the naked eye, but later the tissue is seen of a yellowish color, and is found to have lost its elasticity or resiliency. The effect that such a change in the tissues must have on the circulation and nutrition can be readily conceived, and needs no lengthy mention at this time. The vessel not only loses its elasticity, and consequently a considerable factor in the circulation is lost, but it becomes brittle, and exposed to laceration or rupture in suddenly increased tension. The danger to life is not inconsiderable, therefore, but practically other consequences are more prominent.

Calcification of the vessels is one of the chief results, indeed it may be said to be the second step in a series of changes of which fatty degeneration is the first. There is a partial absorption of the fluid portions of the fat, that which remains having more the appearance of cholesterine, at least it is dry, of a whitish color, and compact. Granules of carbonate of lime now appear, scattered about between the fibres, gradually forming masses, and tending to an organization into plates or laminae, so that in some cases the whole of the media, for considerable distances, will be converted into a calcareous mass, with none of its organic characters remaining. In some cases this degree of organization is not attained, the media being densely infiltrated, but not disposed in plates or laminae.

The same degeneration of the aged, prematurely or naturally--often occurs, without, so far as has been observed, an antecedent fatty disorganization; in such cases the laminated arrangement seems to be the rule. I have seen one case, in which I amputated the thigh for gangrene of the leg, where the femoral artery was a mass of calcareous matter, but not notably laminar in arrangement.

Atheroma is a substance of a "pappy" character, found chiefly in connection with the intima, that ZIEGLER (*Path.*, p. 427) tell us is "essentially a necrosis with granular and fatty disintegration of the intima." It may, therefore, appear *de novo*, in either the media or intima, or be a later phase in fatty degeneration; it is also a frequent antecedent to calcification. It is in most cases the result of inflammation, the *vaso vasorum* being obliterated, and the nutrition of the vessel thereby reduced. Once formed, it has a disposition to set up ulcerative action, which brings about results yet to be considered. It may occupy a small territory, or be widely diffused throughout the vascular system.

Considering these three forms of degeneration to be, as they undoubtedly are, different phases of one and the same thing, namely fatty-metamorphosis, an explanation for the abnormality is lucidly given by ZIEGLER (*l. c.*) as follows: "52. The cause of fatty degeneration is to be sought in an alteration in the constitution of the blood, *i. e.*, of the nutriment supplied to the cells. Deficient supply of oxygen plays a chief part in it. To this must be ascribed, on the one hand, the disintegration of albumen and the formation of fat; on the other hand, the fact that the fat produced is not straightway consumed. If to the lack of oxygen there is added a deficiency of proper nutriment, so that the albumen which is used by transformation into fat, is not replaced, the amount of albumen in the affected part must of course diminish. Corresponding to the case just indicated, we find fatty degeneration taking place in conditions which are associated with general or local anæmia. For example, if the blood becomes diseased in such a way (anæmia, leuckæmia) that its power of taking up oxygen is diminished,

and its nutritive value lowered, fatty degeneration is found to occur in the most widely different organs. The same thing comes to pass in particular organs which happen to receive too little blood, either in consequence of disease in the afferent vessels, or because the outflow of blood from them is checked, or its renewal hindered. Lastly, organs like the muscles, which for any reason are left unexercised, and so fail to undergo an adequate amount of tissue-change, are very apt to become fatty."

A question of interest at this point, might be somewhat enlarged upon. Many of these degenerations are accompaniments of senility, but senility is sometimes acquired and premature. Certain habits, particularly addiction to alcohol, precipitate these conditions, and we thus find aneurysm, and vascular lesions dependent upon such degenerations, commoner among those races in which such habits prevail, as the Irish, and less so among such people as the Arabs. Spontaneous aneurysm will therefore always give rise to the suspicion that the vascular system is abnormal, and thus lead to more enlightened therapeutic measures.

XV.—PATHOLOGY OF THE NERVES

THE pathology of the nervous system is a subject of such enormous magnitude, that it would be utterly impossible to give, in a single chapter, anything even in a summarized form, that would answer any useful purpose, practically or theoretically, that at the same time attempted to cover the ground. Brain and cord surgery are not only subjects to which a large volume could be profitably devoted, but are at the same time of an eminently *special* character. After many changes of purpose, it has been thought best to attempt nothing more than a brief résumé of pathological facts connected with conditions that are oftener presented to the general surgical practitioner, with particular reference to their significance as prodroma of graver neuroses. From this point of view all lesions of nerves may be considered as initial conditions of paralysis or paresis, and can be included under a few heads, as irritative, inflammatory, or degenerative, one leading into the other, in the order of statement.

NEURALGIA.

Neuralgia is an irritation of sensory or motor nerves, giving rise in one case to pain, and the other to reflex phenomena of various kinds. The attacks are usually remittent or intermittent, coming on at irregular intervals, as a rule, although, at times they are periodical, associated with some habitual functional disturbance, as menstruation. The pains are of all kinds and description, having a single characteristic to distinguish them from pains from other causes, *viz.*, their being localized, and in the course of a nerve distribution. Neuritis has the same characteristic, it is true, but with important differences as

will be shown later. During the paroxysm, when it reaches its climax, there may be an extension of the irritation to the motor nerves, when there will be twitching of muscles, or some other symptom of reflex excitement. The temperature, local or general, is little if any affected, although fever is not an uncommon concomitant in severe or protracted cases. The attack passing off leaves the parts perfectly free from pain and sensitiveness, although in chronic cases they are easily re-excited, and the parts remain more or less sensitive to pressure. In such cases, however, it is often more than a mere neuralgia.

The Causes of neuralgia are essentially innutrition, either anæmia or hyperæmia, in all cases, probably, some deficiency in blood-supply will be the controlling factor. The exciting causes are anything which may act as an irritant; local injury, exposure to heat, cold, or wet; over-study, or too close application to business; mental emotions of various kind; fatigue, or indiscretions in eating and drinking. Etiologically these factors are of very secondary value, but in therapeutics they are of the first importance as indices to remedies. It is possible for a single attack of neuralgia to appear without any notable alteration in blood-supply, from the direct application of an irritant, without any general derangement; in other words the condition may be purely local in all respects. The frequent repetition of the irritant, however, will have the effect to establish a permanent irritation in various ways. Inclusion of a nerve in a cicatrix, plastic adhesions to near parts, tension from stretching over a growing neoplasm, compression from similar causes, or anything, in short, that would interfere with the blood-supply, or expose the nerve to constant irritation.

Frequently when a cure is not readily secured by remedies, it will be found that the prescriber has failed to note the fact that a structural lesion is responsible for the symptoms, or that, under other circumstances, he has directed his attention to the *painful point* alone. It scarcely needs mention that an irritant at the root of a nerve does not produce symptoms at that point, at least primarily; the first symptoms are felt at

the distribution. In later stages the point of irritation is indicated by the localization of symptoms. In recent cases of neuralgia, therefore, the point of irritation must be looked for deeper, by tracing up the nerve to its emergence from a foramen, some point of division from a main trunk, or where a sharp turn is made. In many cases neuralgic pains at a distance may be set up, almost at any time, by pressure on such a point. The fact must never be lost sight of that a symptom is *never* purely functional, if by "functional" is meant absence of structural lesion. There are cases in which it is of the utmost importance to determine the *kind* of lesion, if for nothing else than prognostic purposes.

The *significance* of neuralgia, to the surgeon, lies in the fact that all profound nervous diseases have their origin in a neuralgia which gradually passes over into a neuritis, and some form of degeneration, or is caused by some pathological process somewhere in the course of the nerve. For these reasons each case must be carefully studied, the source of the symptoms sought for, and treatment directed to the disposal of the irritant. Frequently the removal of a small tumor, callus from a repaired fracture, or freeing a nerve from cicatricial implication will at once and forever cure a neuralgia that otherwise would have inevitably developed into a neuritis and atrophy, with some form of paralysis.

Treatment.—In ninety-nine cases out of a hundred the indicated remedy will be found promptly curative; in the other case some lesion will be found to which attention must be directed without regard to symptomatic indications. The list of remedies includes pretty much all of the *Materia Medica*, but the following taken from another work (*Surgical Therapeutics*) have been those that have given me the best results.

Aconite.—Vertigo on rising up in bed; crampy sensations at root of nose, making her feel as if going crazy; feeling as if the whole brain would press out at the forehead; she fears to be in a place of excitement or confusion. Insupportable pains, especially at night; shooting or pulsating pains; thirst; redness of the cheeks; small and quick pulse; great sensitive-

ness of the whole nervous system, especially of the organs of sight and hearing. *Worse* in the evening and at night; also from warmth. *Better* when at rest and in the open air.

Allium cepa.—Pains violent and continuous; chronic neuritis, which is wearing the patient out.

Ammonium carb.—Feeling as if the head would burst; anxiety, with inclination to weep; discharge of sharp, burning water from the nose; pale bloated face; much thirst; debility, compelling one to lie down; great sensitiveness to cold; tearing and burning pains; pulse hard, tense and frequent; attacks of chilliness in the evening; during the day and in the morning, perspiration, principally about the joints. *Worse* in the evening; also from wet poultices and pressing the teeth together. *Better* from pressure and warmth.

Anacardium.—Loss of memory; fluent coryza; loss of taste; diminished sensibility, particularly of smell, sight and hearing; sensation as if a hoop or band were around the parts; pulse accelerated, with beating in the veins; coldness internally, with external heat; clammy perspiration of palms of the hands. *Worse* in morning, periodically; also from rubbing. *Better* during dinner. Left side.

Apis mel.—Restlessness; twitching of the eye-balls; œdematous swelling of the lids; redness and swelling of both ears; burning or stinging heat in the face, with purple color; œdematous swelling of the face; thirstlessness; tension over the eyes, behind the ears and in the neck; pulse full and rapid, or small and trembling; intermitting pulse; chilliness from the least movement, with heat of the face and hands; sharp pain like a bee-sting. *Worse* in the morning, evening, and at night; also from heat. *Better* from cold. Left side.

Arnica.—Crawling, pricking in the part; agitation and restlessness, which compel the patient to move the parts continually; great sensitiveness to noise; heat of face, cold body; hot, red, shining swelling of one cheek; burning, hot, cracked lips; thirst, desire for cold water; longing for alcoholic drinks; pulse very variable, mostly hard, full, and quick; internal chilliness, with external heat; perspiration smelling very

sour, sometimes cold. *Worse* in the morning, evening and at night; also on moving, being touched, and from cold. *Better* from warmth.

Arsenicum.—Burning or tearing pains, felt even during sleep; pains become insupportable, so that he becomes furious, and despairing; great anguish; excessive weakness, so that he has to lie down; intermission of the pain, when sensation of coldness in the part affected; the pain is so great that the patient is continually moving from room to room, or place to place; swelling and burning of the nose; fluent coryza of burning, sharp, excoriating water; puffiness of the face, especially around the eyes; distorted features; lips black, dry and cracked; longing for cold water, acids, and alcoholic drinks; sudden sinking of strength; pulse frequent in the morning, slower in the evening; skin dry like parchment. *Worse* at night, and in morning; also from cold, when lying on the affected side. *Better* from heat in general.

Asafetida.—Hysterical restlessness and anxiety; sensation of numbness of the bones of face; twitching and jerking in muscles; pulse small, rapid, and unequal. *Worse* in the afternoon and evening. *Better* in the open air. Left side.

Arum met.—Melancholy mood, dejected, inclined to weep, and longing to die; almost driven to suicide; fiery sparks before the eyes; roaring in the ears; very sensitive smell; bloated, shining face; immoderate thirst; hysterical spasms with laughing and crying alternately; pulse is small, but accelerated. *Worse* in the morning; also from cold. *Better* from motion and warmth.

Bartya c.—The light hurts the eyes; in the dark he sees spots before them; dark redness of the face; tension on the face as if it were covered with spider's webs; flushes of heat; pulse weak, but accelerated. *Worse* at night; also when thinking of it. *Better* in open air.

Belladonna.—Nervous anxiety and restlessness; eyes sparkling, red, and glistening; looks wild, unsteady; inflammation of the ear; dullness of hearing; inflammation and redness of the nose; sense of smell preternaturally acute; purple-red and

hot face; alternate redness and paleness of the face; spasmodic distortion of the mouth; violent cutting pains; the upper lip is swollen; excessive burning thirst; inability to swallow; pulse accelerated, often full, hard and tense; sometimes soft and small; if slow the pulse is full; dry heat with thirst; perspiration on the head, or only on those parts that are covered; the patient seems to be in a stunned or stupid condition. Comes suddenly, goes as quickly. *Worse* at night; also from the least touch, from light, or noise. *Better* while lying down and from strong pressure. Right side.

Bismuth nit.—Excruciating pain, relieved by pressure, and on moving about.

Bryonia.—Expansive pains; exceedingly irritable, inclined to be angry; burning in the eyes, and edges of the eyelids; the eyes feel as if pressed out of the head; the upper lids are particularly swollen; does not drink often, but much at a time; swelling of the affected parts, with inability to move them; pulse full, hard and tense; perspiration profuse, and very easily excited; restless, but compelled to keep very still. *Worse* in the evening; also from motion, or sitting up in bed, and from heat. *Better* on getting warm in bed. Right side.

Calendula off.—Provings of this remedy are very incomplete, but the little use I have made of it justifies me in recommending its use, topically at all events, in neuritis resulting from a lacerated wound.

Camphora.—Great anguish and discouragement; confusion of ideas; aversion to light; usually thirstlessness; sometimes violent thirst; sudden and great sinking of strength; death-like paleness of the face, alternating with redness; icy-cold face, purple or pale; distorted countenance; foam at the mouth; icy-coldness of whole body, with paleness of face; pulse small, weak and slow; cold perspiration, often clammy, and always very debilitating. *Worse* at night; also from cold. *Better* when thinking of it.

Cannabis ind.—Heat of the skin; copious perspiration; pulse very slow, with nausea; general restlessness; desire to sleep, inability to do so; dry mouth and thirst.

Cantharides.—Anxious restlessness, ending in rage; eyes protruding; fiery, sparkling, staring look; death-like appearance; expression of terror and despair; hot, red, and swollen face; thirst, but yet an aversion to all fluids; pulse hard, full, and rapid; burning heat, with anxiety and thirst; cold perspiration, smelling like wine. *Worse* in the afternoon and night; also from coffee. *Better* from lying down. Right side.

Capsicum.—Peevish, easily offended; redness of the cheeks without heat, often changing to paleness; swollen and cracked lips; thirstlessness; pulse irregular, and often intermitting; heat, with perspiration and no thirst. *Worse* in the evening, and at night; also when eating or drinking or beginning to exercise. *Better* from continued exercise.

Carbo veg..—Sensitiveness and irritability; burning and pressing in the eyes; pulsations in the ears; great paleness of the face, swollen face and lips; greenish color of the face; excessive thirst; numbness of the limbs (and parts affected); burning pain; pulse small, weak, imperceptible, uneven or intermittent pulse. Burning like a coal of fire, in a small spot. *Worse* in the morning and forenoon; also in the open air, from poultices and pressure. *Better* after lying down.

Causticum.—Melancholy, peevish, low-spirited; buzzing and roaring in the ears and head; painful swelling of the external ear; yellowness of the face, especially the temples; spasmodic sensation in the lips; sensation of tightness and pain in the jaws, making it very difficult to open the mouth or to eat; violent thirst for cold drinks; pulse only accelerated towards evening; flushes of heat; sensation of internal chilliness; followed by perspiration without previous heat; perspiration is sour. *Worse* in the evening; also in the open air. *Better* from heat.

Cedron.—Unvarying periodicity to the hour.

Chamomilla.—Ill-humor, taciturn; aversion to a bright light; sensitive hearing and smell; bloatedness of the face; swelling, with hardness and blueness of one cheek; heat of the face while the rest of the body is cool; great thirst, with longing for cold water; great prostrating debility as soon as

the pain begins; pulse small, tense, and accelerated; heat, with occasional chills; heat, with anxiety, and perspiration of the face and scalp. Wild and unruly; wants relief at once, hot sweat, from pain. *Worse* at night; also while lying down, and during sweat. *Better* while fasting, and on rising. Left side.

China off.—Indifference and apathy; humming in the ears; heat and redness of the nose; violent thirst for cold water; drinks often, but very little at a time; face pale and sunken; red and bloated face; the lips are swollen; pulse small, hard, and rapid, or irregular; over-sensitiveness of the nerves from loss of fluids. Pale and prostrated after attack. *Worse* at night; also from the slightest touch, after drinking. *Better* in the room, and from strong pressure.

Cicuta vir.—Hardness of hearing; deadly paleness of the face, with coldness of the face and hands; red face; grinding of the teeth; the throat feels closed; inability to swallow; violent thirst; spasms of the muscles, especially of the neck and chest; pulse weak, slow, and trembling; internal heat. *Worse* in the afternoon; also from cold. *Better* when in bed, and from warmth.

Cimicifuga.—Severe pain in the left jaw; heat on one side of face, with lassitude all over; very severe pain in the face, more in under jaw, lower teeth, and articulation of lower jaw; pains in head and face constant, and very severe; pain in right superior maxillary bone and teeth.

Cina.—Disposition to be offended by trifling jests; bloated, pale face, with blueness around the mouth; pale, cold face, with cold perspiration; increased thirst; the body is stretched out, and becomes rigid; dull stitches in different parts of the body; the limbs twitch, and are distorted; pulse small, hard, and rapid. *Worse* at night; also from external pressure. *Better* after lying down. Left side.

Coccus.—Pain in the eyes, as if they were torn out of the head; hardness of hearing, with noise as of rushing water; heat in the face, and redness of the cheeks; sensation of extreme weakness; disposition to tremble; trembling of all

the limbs; pulse small and spasmodic, sometimes it cannot be felt; perspiration of the parts affected. *Worse* in the evening; also from talking, sleeping, drinking, and in the cold air. *Better* from pressure and warmth.

Coffea.—Over-sensitiveness; weeping mood; sense of hearing more acute; dry heat in the face, with red cheeks; nightly thirst; the pains are intense, driving to despair; twitching of the limbs; chilliness increased by every movement; head feels contracted and too small. Slight pain unendurable; hysterical. *Worse* at night; also from the open air. *Better* from cold water in the mouth.

Colocynth.—Aversion to talk; disinclined to answer questions; pulsation and rushing in the ears; fluent coryza; face pale and relaxed, with sunken eyes; dark redness of the face; tearing, or burning, or stinging pain on the left side, extending to the ear and head, swelling of the face, with redness and heat of one cheek; twitching of the muscles; faintness with coldness of the extremities; burning pains; pulse full, hard and accelerated; internal heat; attacks of flushes of heat. Cutting, lancinating pain. *Worse* in afternoon and evening; also when lying down, and lying on painless side, or making least motion. *Better* when lying on painless side, and from motion.

Conium mac.—Inclination to start as if with fright; great and painful sensitiveness of hearing; roaring and humming in both ears; excessively acute smell; heat in the face stinging-tearing faceache; dry and scaly lips; sensation of debility; sudden loss of strength when walking; pulse irregular, generally slow and full, alternating with small and frequent beats. *Worse* in the morning and night; also when eating, standing, or at rest. *Better* from motion. Right side.

Digitalis.—Great anxiety, and inclination to shed tears; gloomy and peevish; blueness of the eyelids; swelling of the lower lids; hissing before the ears, like boiling water, with hardness of hearing; pale face, with blueish hue under the pale skin; convulsions on the left side of the face; faintness and debility with perspiration; great nervous weakness; pulse

is very slow, especially when at rest; pulse irregular and intermitting; while moving about the pulse is accelerated; internal chilliness with external heat; chilliness with heat and redness of the face; sudden flushes of heat, followed by great debility. *Worse* after dinner. *Better* when lying down.

Elaterium.—Depression of spirits, fever with violent tearing pain throughout the head. *Better* from perspiration.

Euphrasia.—Taciturn, disinclined to talk; swelling of the lower eyelids; redness of the face; stitches and stiffness in the cheek and lower jaw when talking or chewing; crawling as of a fly in one or other of the limbs, from below upwards in a straight line, with numbness of the part. *Worse* in the evening; also when wet. Left side.

Ferrum.—Anxiety, as after committing a crime; quarrelsome disposition; inflammation and redness of the eyes, with burning and stinging; pale bloated face, especially around the eyes; fiery redness of the face, the veins are enlarged; pale face with red spots; unquenchable thirst; longing for acids; weakness of the body almost paralytic; so weak that she must lie down; pulse full and hard; violent ebullitions. *Worse* in the morning; also when at rest. *Better* from slow exercise. Left side.

Gelsemium.—Great irritability, does not wish to be spoken to; aversion to light, particularly candle-light; heat in face, with fullness in head, and cold feet; stiffness of the jaws—they are locked; pulse slow, accelerated by motion. Loss of control, like chorea. *Worse* at night; also on walking.

Graphitis.—Melancholy, with inclination to grief; easily vexed; pressure and stinging in the eyes, with lachrymation; feeling as if the ear were filled with water; pale, yellow color of face; continued feeling as if from a cobweb over the face; violent thirst, early in the morning; pulsation through the whole body whenever he moves; pulse full and hard, but not accelerated; inability to perspire. *Worse* at night; also from cold. *Better* from warmth, and on getting warm in bed.

Gratiola.—Serious, taciturn, absorbed in reverie; burning heat in the face; face feels swollen; violent thirst; physical

and mental depression; great languor and prostration; tetanic spasms, feeling bruised on recovery. *Worse* in the afternoon; also when sitting, and after eating. *Better* from contact.

Hepar sulph.—The slightest cause irritates him, and makes him vehement; dejected, sad, with inclination to shed tears; inflammation of the eyes and lids; darting pains in the ears; redness and heat of the nose; heat and fiery redness of the face; yellow color of the face, with blue borders around the eyes; fainting from slight pain; weakness of all the limbs, they feel bruised; pulse full, hard, and accelerated, at times intermittent; flushes of heat, with perspiration. *Worse* at night; also from cold, and on touching the parts. *Better* from warmth, when part is well wrapped up.

Hyoscyamus.—Red, sparkling eyes; heat and redness of the face; swollen, brown-red face; distorted blueish face, with the mouth wide open; repeated attacks of fainting; subsultus tendinum; pulse full, hard, and accelerated; distention of the arteries; cold, sour-smelling perspiration. *Worse* in the evening; also after eating or drinking. *Better* by stooping.

Hypericum perf.—Sensation as if the head became elongated; stitches in the right eye; shooting through the ear; the face feels hot and bloated; tension in the cheek; thirst with feeling of heat in the mouth; violent thirst; feeling of weakness and trembling in all the limbs; pulse hard and accelerated. Great soreness and sensitiveness. *Worse* in the afternoon; also after eating. (*Vide* LIPPE, p. 294, symp. 39, for lacerated wounds of nerves especially.)

Ignatia.—The slightest contradiction irritates; intolerance of noise; cannot bear the glare of light; alternate redness and paleness of the face; redness and heat of one cheek and ear; perspiration only on face; trembling of the limbs; pulse hard, full, and frequent, or very variable; flushes of heat externally. *Worse* in the morning and evening; also when lying down, from coffee, tobacco, and brandy. *Better* when lying on the back, and from a change of position.

Ipecacuanha.—Irritability, restlessness, impatient; cannot bear the least noise; pale face, with blue margins around the

eyes; convulsive twitches in the muscles of the face and lips; opisthotonos, and emprosthotonos; great weakness, and aversion to all food; over-sensitiveness to heat and cold, twitching in the limbs; the body is stretched out stiff; pulse very frequent, but at times scarcely perceptible; damp coldness of the hands and feet. *Worse* at night. Right side.

Iris vers.—Pain intense, with nausea, and vomiting of sweetish mucus.

Kali bich.—Ill-humor, low-spirited, indifferent; sudden attacks of giddiness on rising from the seat; eyelids burning inflamed and much swollen; œdematous swelling of the eyelids; sensitive painfulness of the bones of the face, as if bruised; perspiration on the upper lip; increased thirst; stiffness of the neck when bending the head forward; quickly moving, wandering pains, from one part of the body to the other; great debility, with desire to lie down; pulse small and accelerated; hot, dry skin. *Worse* in the morning, and periodically; also from cold, and after eating. *Better* from warmth.

Kali carb.—Angry, and irritable; easily startled, especially if touched; painful sensitiveness of the eyes to the light of day; dullness of hearing; dullness of smell; face bloated; yellow color of the face; swelling and redness of the cheeks; twitching of the muscles; pulse very variable; strong pulsations in the arteries; internal heat, with external chilliness; the perspiration is foetid or smells sour. *Worse* in the morning; also in cold air and when lying on the side. *Better* from warmth.

Kalmia lat.—Sensation of stiffness around the eyes, and in the lids; coryza, with increased sense of smell; paleness of the face; stitches and tearing in the lower jaw; pulse slow and weak; heat, with burning and pain in the back and loins; cold perspiration; dry skin. *Worse* in the evening; also in the open air, and from motion. *Better* when lying down.

Lachesis.—Nervous irritability; paleness, yellowness, or lead-like color of the face; heat and redness of the otherwise pale face; great thirst; stiffness of the neck; tearing, pricking, and pulsating pains; inclination to lie down, and aversion to move; pulse small and weak, but accelerated, or else un-

equal and intermittent, or alternately full and small pulse; skin of the part blueish-red. *Worse* in the evening; also in the open air, from cold and after sleep. *Better* from warmth. Right side.

Ledum pal.—Great coldness, both subjective and objective.

Lycopodium.—Low-spirited, taciturn, melancholy; oversensitiveness of hearing; the same in regard to smell; paleness of the face; flushes of heat in the face; spasmodic twitching in the muscles of the face; the lower jaw hangs down; painful stiffness and soreness of one side of the neck; involuntary alternate contraction and extension of the muscles in different parts of the body; sensation as if the circulation stood still; want of natural heat; violent perspiration from the least exertion; constricted feeling in part. *Worse* in the evening; also when lying down, from the pressure of the clothes, and strong smells. *Better* from cold. Right side.

Magnesia carb.—Anxious, with perspiration all day; sad mood, with indisposition to talk; sensitiveness to noise; pale face; earthy, sickly complexion; alternate redness and paleness of the face; desire for acid drinks; stiffness of the neck; painfulness of the whole body; pulse slightly accelerated during the night. *Worse* at night; also from talking, or mental emotion. *Better.*—Symptoms are better from walking, which come on while sitting, and *vice versa*.

Manganum.—Out of humor, low-spirited, and reflective; eye-lids swollen, and painful to the touch; face pale and sunken; twitching stitches from lower jaws to temples when laughing; cramping pain in the upper and lower jaws after eating; no thirst; stiffness of the nape of the neck, pulse very uneven and irregular; sudden flushes of heat in the face, chest, and over the back; profuse perspiration, with short anxious breathing. *Worse* at night; also on stooping, and on being touched ever so lightly. *Better.*—Symptoms are better in the open air, which come on in the room, and *vice versa*.

Mercurius.—Copious perspirations, which do not afford any relief; sweat at every motion; violent thirst, swelling, redness and closing of the eyelids; feverish heat and redness of the

face; swelling of the cheeks; almost complete immobility of the jaw; swollen and stiff neck, with difficulty of turning the head; painful closing of the jaws. *Worse* in the evening and night; also from the heat of the bed, when exercising, and in damp weather. *Better* when at rest, and when lying down.

Mezereum.—Restlessness when alone, and longing for company; twitching of the muscles around the eyes; visible twitching on the root of the nose; gray, earthy complexion; frequent troublesome twitching of the muscles in the middle of the cheek; face and forehead hot and red, with great restlessness and peevishness; tension of the muscles; twitching of muscles; pulse full and hard, in the evening accelerated; sensitive to touch. Pains come on like electric shocks. *Worse* in the evening, and at night; also from contact and motion. *Better* when walking in the open air.

Moschus.—Great anxiety, with palpitation of the heart; vertigo as soon as the head is moved; pale face, with perspiration; the right cheek is red without heat, the left pale and hot; heat in the face without redness; tension in the facial muscles as if too short; movement in the lower jaw as if he were chewing; great dryness of the mouth; pulse full and accelerated, with ebullitions, or weak pulse. *Worse* in the afternoon, also in cold air. *Better* from warmth.

Natrum mur.—Great tendency to start; difficulty of thinking; face shining, as if greasy; heat in the face; swollen face; tingling and numbness of the lips; tension and drawing in the back part of the head; painful stiffness of the neck; twitching in the muscles and the limbs; pulse very irregular; beating of heart shakes the whole body. *Worse* in the morning; also from physical exertion. *Better* when fasting, and after lying down.

Nitric acid.—Sadness, despondency, vexed at trifles; eyes dull and sunken, with pale face; swelling of the cheeks; violent thirst; stitches in and between the shoulder-blades, with stiffness of the neck; flushes of heat with perspiration on the hands; pulse very irregular, one normal beat often is followed by two small rapid beats, the fourth beat entirely intermitting;

alternate hard, rapid, and small beats. *Worse* in the evening, and at night; also on waking, and from touch. *Better* from warmth.

Nux vom.—Over-sensitiveness to external impressions, such as noise, light and smell; reeling vertigo on rising from seat or the bed, or on raising the head; yellowness around the mouth and nose, or around the eyes; red, swollen face; burning redness of the face, with heat; the muscles of the face twitch in the evening when lying down; trismus; longing for brandy, but aversion to water; tension between the shoulder-blades; sensation in the small of the back, as if lame; heaviness and stiffness of the neck; stitches in jerks through the whole body; pulse full, hard, and accelerated, or small and rapid, or every fourth beat intermits; general internal heat. Morose, irritable; tearing with numbness. *Worse* in the morning; also from motion and slight touch, on waking in the morning, and after eating. *Better* from strong pressure. Right side.

Oleander.—Absence of mind, want of attention; vertigo on rising from the bed, or on looking fixedly at an object, or when looking down when standing; alternate paleness and dark redness of the face; numbness of the upper lip; much thirst, especially for cold water; fainting as if from weakness, relieved by perspiration; pulse very changeable and irregular. *Worse* at night; also when rising from the bed, and when eating. *Better* when lying down, and from perspiration.

Opium.—Stupid indifference; stupefying vertigo, compelling one to lie down; the eyes are half open and turned upwards; swelling of the lower lids; the eyes feel too large for the orbits; the face is bloated, dark-red, and hot; blueish face; trembling, twitching, and spasmodic movements of the muscles of the face; corners of the mouth twitch; distortion of the mouth; hanging down of the lower jaw; the veins of the face are distended; violent thirst; the body is spasmodically bent backwards; rigidity of the whole body; pulse varies very much; heat with damp skin. *Worse* at night; also on rising, during and after sleep. *Better* from moving.

Petroleum.—Excited, irritable, with inclination to anger;

yellow complexion; twitching in the limbs; great debility, with trembling; pulse full, and accelerated from every motion; flushes of heat. *Worse* in the morning and evening. *Better* from warmth. Right side.

Phosphorus.—Great excitability, easily vexed and angry; pale, hypocratic countenance; the color of the face is very changeable; bloated face, puffiness under the eyes; eyes are sunken, with a blue ring around them; thirst, stiffness in the neck; over-sensitiveness of all the senses; ebullitions and congestions; pulse generally accelerated. *Worse* in the evening, and at night; also when alone, and from strong smells. *Better* in the dark, from rubbing, and after sleeping.

Phytolacca.—Great indifference; shooting pain from left eye to vertex; vertigo and dimness of vision; pale face; the pains are pressing, shooting and sore.

Plantago.—Neuralgia from abuse of tobacco.

Platina.—Low-spirited, inclined to tears, great indifference; spasmodic twitching and trembling of the eyelids; redness and burning heat in the face, with violent thirst towards evening; sensation of coldness, tingling and numbness in the face; pale, sunken countenance; thirstlessness; stiffness of the neck; weakness, tension, and numbness in the neck; pulse small, feeble; frequently it is tremulous; objects appear smaller than they really are. Boring, or pain as if part were being squeezed. *Worse* in the evening; also when at rest. *Better* during motion.

Pulsatilla.—Peevishness, which increases to tears, with chilliness and thirstlessness; vertigo, as if intoxicated, when rising from the seat, when stooping, or when lifting up the eyes; swelling and redness of the eyelids; alternate redness and paleness of the face; face bloated, purple; painful sensitiveness of the skin of the face; stitches in the small of the back; burning-stinging pains; pulsation through the whole body; fainting, with great paleness of the face; pulse weak and small, but accelerated. *Worse* in the evening; also from warmth, and being in a warm room. *Better* from cold, and in the open air. Right side.

Rhus tox..—Restlessness which does not permit one to be quiet, and compels him to toss about in bed; swelling of the eyelids: aversion to light; face pale and sunken, with blue rings around the eyes, and pointed nose; stiffness in the articulations of the jaws; thirst; inflammatory swellings; pulse irregular, generally faster, but weak. *Worse* in the night; also when beginning to move, when at rest, and from cold. *Better* from motion and warmth. Right side.

Rhus rad..—Excessive debility; restless nights; pulse frequent and small; confusion of the head; redness and swelling of the eyelids, with itching and burning; burning in the face, with redness and itching; vesicles on the face; thirst at night; pain and rigidity in the posterior lumbar region; muscles of the neck pained by movement, and sensitive to pressure. *Worse* when beginning to move. *Better* when walking in the open air. When the *Rhus tox.* fails to cure, although apparently well indicated, I advise the use of this remedy.

Ruta grav..—Anxious and low-spirited; inclination to quarrel and contradict; great heat in the head, with much restlessness; spasms of the lower eyelids; violent thirst in the afternoon: pulse only accelerated during the fever; heat in the face, with red cheeks, and cold hands and feet. Pain in nerves that have been stretched, as in sprains. *Worse* in the afternoon; also in cold weather, when sitting, during rest. *Better* from motion. Left side.

Sabadilla..—Anxious restlessness, startled by noise; burning heat and redness of the face; great debility, with relaxation or heaviness of the body; pulse small and spasmodic. *Worse* in the forenoon, and at night; also from cold. *Better* from warmth.

Secale..—Great anxiety; distortion of the eyes; dark redness of the face; spasmodic distortion of the mouth and lips; violent, unquenchable thirst; convulsive twitching in the limbs; pulse unchanged, even in the most violent attacks; violent, and long-continued dry heat, with great restlessness and violent thirst. *Worse* at night; also from warmth, touch and motion. *Better* from cold, and rubbing. Right side.

Sepia.—Sadness, with weeping; anxiety, with flushes of heat; neuralgic pains from abuse of tobacco; swelling of the upper lip; stiffness in the small of the back and neck; pulsations in the small of the back; inflammatory swelling, vibrations like dull tingling in the body; the pulse is full and quick, accelerated by motion and anger; pulsation in all the blood vessels. Jerking like electric shocks. *Worse* in the forenoon and evening; also from mental emotions, when at rest, and after eating. *Better* from warm air, and violent exercise.

Silica.—Pale, earth-colored face; jaws spasmodically closed; spasmodic pain in the small of the back, which does not allow one to rise; twitching of the limbs day and night; pulse small, hard, and rapid; the circulation is easily excited; perspiration only on the head. *Worse* in the night; also in the open air, from cold, and pressure. *Better* from warmth. Right side.

Spigelia.—Difficulty of thinking, and disinclination to mental exertion; giddiness when looking downwards; vertigo with nausea; sensation as if the eyes were too large; pale, bloated, and distorted face; perspiration on the face; periodical face-ache; pains burning, and tension, especially in the cheek-bones, above the eyebrows, in the eyeball, and in the left side; violent thirst; pulse irregular, generally strong, but slow; trembling pulse; cold perspiration. Acute pain, better from *strong* pressure. *Worse* in the forenoon, and at night; also from noise, movement, touch, and stooping. *Better* after lying down. Left side.

Stannum.—Great anxiety and restlessness; vertigo; it seems as if all objects were too far off; burning-stitches in the eyelids; pale sunken face, with deep-sunken eyes; pulse small and quick; anxious sensation of heat from the least movement; pains which increase gradually to the maximum and then gradually decrease. *Worse* in the evening; also after moving, and from talking. *Better* from loosening the garments, and when lying on the back. Left side.

Staphysagria.—Weakness of memory; countenance sunken, with sunken eyes, and peaked nose; blue margins around the

eyes; violent upward stitches in the back; twitches at night; pulse very fast, but small and trembling. *Worse* about the same all times of day, except evening. *Better* in evening. Right side.

Stramonium.—Very changeable disposition; red, inflamed, swollen eyes; contortion of the eyes and eyelids; red, swollen, and turgid face; stupid, distorted countenance; anxiety and fear is expressed in the countenance; distortion of the mouth; violent thirst, drinking large quantities; body bent backwards, with distorted countenance; pulse very irregular, generally small, hard, and quick; hot, red face, with cold hands and feet. *Worse* in the morning; also after sleep, from touch, and when alone. *Better* from bright light.

Sulphur.—Peevish and irritable; face pale; circumscribed red spots on the face; red blotches on the face; sunken eyes, with blue margins; trembling and twitching of the lips; cold perspiration on the face; constant thirst; stiffness in the neck; drawing in the back; pain in the small of the back, not permitting one to stand erect; great debility and trembling, talking fatigues; pulse full, hard, and quick, at times intermitting; swollen veins; cold nose, hands, and feet; dry heat with thirst; flushes of heat; perspiration easily excited, or want of perspiration. *Worse* in the evening; also on waking, or getting warm in bed, from bodily exertion, talking, when at rest, and from being touched. *Better* from motion. Left side.

Teucrium.—Great sensitiveness and excitability; pale face; frequent feeling of flushes of heat, without redness; nervous excitability; trembling sensation of the whole body. *Worse* in the forenoon, and at night; also on stooping, and to the touch. Right side.

Thuja.—Over-excited; becomes angry at trifles; vertigo on closing the eyes, disappears on opening them; heat and redness of the whole face, with fine nets of veins, looking as if marbled; circumscribed burning redness of the cheeks; greasy skin of the face; swelling of the temporal arteries; neuralgia, originating in the left cheekbone, near the ear, extending through the teeth to the nose, through the eyes into

the temples, and into the head; the painful places burn like fire and are very sensitive to the rays of the sun; violent thirst; beating and pulsating in the back; jerking in the upper part of the body; pulse in the morning slow and weak, in the evening accelerated and full; in the evenings, violent pulsation; swelling of the veins. *Worse* in the morning, evening, and at night; also from cold-wet and the heat of the bed. *Better* from warm-wet, and on turning from the left to the right side.

Valerian.—Very changeable disposition; redness and heat of the cheeks, especially in the open air; over-sensitiveness of the cheeks, especially in the open air; over-sensitiveness of all the senses; pulse irregular. *Worse* in the forenoon, and towards evening; also while reposing, when standing, and in the sun. *Better* in the light, and from motion.

Veratrum.—Vertigo, with cold head; perspiration on the forehead; face pale, blueish, cold, disfigured, like death; blue or green circles around the eyes; spasms of muscles when masticating; violent, unquenchable thirst, particularly for cold water; back and small of the back feel sore and bruised; sudden sinking of strength; shocks in the limbs, as from electricity; spasms, with convulsive motions of the limbs; tetanic stiffness of the body; pulse irregular, generally small and thread-like, and weak; slow pulse, often it cannot be felt at all; perspires easily from the least exertion. *Worse* in the morning; also after sleep, and during perspiration. *Better* after perspiration.

Viperi redi.—Opisthotonos; cold sweat; restlessness; frequent vertigo; protruded eyes; face swollen; oppression of chest.

Zincum.—Very variable mood; paleness of the face; stiffness and tension of the neck; pulsations through the whole body; violent trembling, twitching of the body; pulse small and rapid in the evening, slower in the morning and during the day; pulse at times intermitting; violent pulsations in the veins; flushes of heat, with trembling, and short, hot breath; badly-smelling perspiration; perspires easily during the day,

and on exercising. Burning; quick stitches and jerking; cannot keep quiet; in constant motion. *Worse* in the afternoon and evening; also after eating, in the warm room, and from least touch. *Better* in the open air.

An agent of very great efficiency, so say those who have had experience with it, is Electricity, in some of its forms. BUTLER (*Electro Therap.*, p. 100), thus speaks of it:

“1. The whole of the trunk of the affected nerve must be included in the circuit.

“2. *Regularity* of applications, which in all cases ought to be *repeated at least daily*. These conditions being observed it matters little whether the current be transmitted in an ascending or descending direction.” Going on to state that either galvanism or Faradism may be used, he gives the following rules:

“1. That whatever form of current be used, only the very mildest intensities are curative.

“2. That a large percentage of cases are cureable by a strict attention to this rule.

“3. That high intensities of either form of current produce serious aggravations.

“4. That a certain proportion of cases yield to the galvanic current, that cannot be cured by the Faradic, and *vice versa*.

“5. That it is impossible always to tell beforehand, which form of electricity will cure any given case, any more than we can always tell which potency of a drug remedy is the proper one to use.

“6. That there are undoubtedly a small proportion of cases that will yield to neither form of current administered alone, that will rapidly improve under a judicious alternation of the forms.

“7. That the number of cases which entirely resist every form of electrical treatment is very small indeed.

“8. That where the nerve is deeply seated, electro-puncture of the sheath, or even of the nerve itself, becomes necessary, as otherwise recomposition takes place in the more superficial structures, without the current reaching the nerve at all.

This operation must be performed by a thorough expert in electro-therapeutics, as without the greatest skill being exhibited, electrolysis of the nerve takes place, which is not only fatal to success, but disastrous in its consequences.

“9. A BRENNER’S rheostat should always be used in the circuit; also a galvanometer, for obvious reasons.”

Such is the summary of one whom I believe to be a thorough expert in electro-surgery, and my limited experience has led me to fully endorse the views expressed. Nevertheless, as we learn more of electricity, we shall come to know the indications as accurately as any other medicinal agent in common use. It is the indiscriminate and ignorant use of this remedy that has brought it somewhat into disrepute.

NEURITIS.

Neuritis is an inflammation of a nerve, a development from a neuralgia. The passage from a state of irritation to one of inflammation is a very gradual one, and it is doubtful if the exact time of the change can be diagnosticated in any case. There are still periods of exacerbation, with remissions, very like the semeiology of neuralgia, but there are certain pathognomonic symptoms, both during the paroxysms and the remission, that never occur in simple neuralgia. In the periods of remission the nerve is sensitive to pressure or irritation, which never occurs in pure neuralgia. Putting the nerve on the stretch will always be painful, as is conveniently shown in sciatica; the extremity being fully extended, is flexed on the body, keeping the leg straight—and the tension of the nerve will always cause sharp pain. In neuralgia such a procedure would probably bring on an attack, but the manipulation itself would not be painful. The repeated attacks of inflammation cause pain of equal severity to those of neuralgia, which does not pass off as suddenly or completely; later there is only a partial remission, more or less pain being felt at all times. The results, as to the structural integrity of the nerve are various, depending on conditions not yet understood. In some cases the nerve becomes notably enlarged; in others atrophied;

in some cases again it undergoes a softening degeneration, and in still others becomes sclerosed. In a few instances neoplasma form, either in the substance of the nerve, within the nerve, within the neurilemma, or outside, but attached to the sheath.

The effects on the function of the part are likewise various. Thus when motor fibres are chiefly affected, choræic symptoms predominate; under all circumstances there will be, after a time, notable loss of power or function, as degenerative changes occur.

One symptom should not be forgotten, *viz.*, the signs of inflammation, during a paroxysm, very different from what obtains in a simple neuralgia.

The Pathology will be more appropriately referred to later, and thus avoid repetition. It is sufficient to state at this time, that the tendency of neuritis is to destruction of the nerve by trophic or degenerative changes, which must result in loss of function of all parts or organs under its influence.

The Treatment must often be surgical, but not so frequently as some writers would have us believe. Of course if the practitioner allows a case of neuralgia to pass over into a neuritis, he has lost an opportunity. However, many cases are brought to the surgeon after the development of the inflammation, and he is obliged to take the case as he finds it. The indicated remedy is a potent curative agent, so much that patience in securing indications will rarely fail in conferring the reward. There are cases, however, as was stated under inflammation, when other means must be employed, but the detection of the lesion is not difficult, as a rule, the pain being distinctly localized. A neuritis due to inclusion of a nerve in a scar, or the like injury, must always demand its release, and yet even in such cases *Silica* has more than once loosened such adhesions in a surprising manner.

The remedies indicated are those already given under *neuralgia*, to which reference may be had.

ATROPHY OF NERVES.

Atrophy of a nerve is brought about in the same way that atrophy of any tissue is, *viz.*, by cutting off its blood-supply, not suddenly, but by a gradual diminution. This may be a result of inflammation, with fibrinous exudation; over-tension of a nerve, in various ways; pressure, or by section. In this last case it is the distal portion that atrophies. The wasting is supposed to be more rapid in the axial substance, and yet it is possible that all the structures suffer contemporaneously. There will be a progressive loss of function, as the process goes on, with complete paralysis when the nerve is destroyed. The symptoms are not at all recognizable, the progressive paralysis being the same in sclerosis or softening.

HYPERTROPHY OF NERVES.

Hypertrophy is a result of hyper-nutrition, a gradually increased vascularity, which may be secondary upon neuritis, or due to some obstruction in the circulation elsewhere. An example, perhaps, may be found in the nerves of the stump, after amputation. The symptoms are those of neuritis, usually not of a high grade, and at the most a diagnosis can only be a more or less intelligent guess. In many cases hypertrophy, itself a sequel to neuritis, is but the first step in further change, such as softening or sclerosis, perhaps oftener the former.

SOFTENING OF NERVES.

A Sudden and complete cutting off of the blood supply to a nerve, or a portion of it, will have the effect to cause destruction of the organ by a breaking down of the proper nerve elements, which are ultimately carried away by absorption, followed by atrophy of the fibrous frame-work. The result is the same, in the end, as atrophy above described, the process being more rapid in proportion to the suddenness with which the blood-supply is cut off, or in other words its completeness.

SCLEROSIS OF NERVES.

Sclerosis or hardening of nerves, is due to an inflammation

confined to the sheath or other part of the fibrous frame-work, of a low intensity, which determines a fibrinous or plastic growth inwards. The result is in another form of atrophy, the nerve being converted into a fibrinous cord, by connective-tissue proliferation inwards, and destruction of the nerve-elements by compression.

The Treatment of these degenerative processes cannot be given in any detail. In many of them, surgery, pure and simple, is the only recourse; in others the symptoms furnished in each case, must be the guide for selection of a remedy. In still others the pathological state, if it can be determined, will alone give the remedy. Thus, if due to cicatricial compression, *Silicea* will be first considered, regardless of symptoms. If sclerosis can be made out, *Argent nit.*, *Picric ac.*, or *Oxalic acid* will claim attention. The limits and plan of this work forbid a full account of the therapia, as the necessary indications are obscure and would require a volume to elucidate. The purpose of this chapter will be fulfilled, if attention is directed to the importance of considering neuralgia a prodroma of these late lesions, and thus prompting the practitioner to a careful consideration of every such case that may be presented to him.

XVI—VENEREAL CONTAGION

NOTWITHSTANDING there is good reason to believe that venereal diseases, in some form at least, have existed ever since the first appearance of man on earth, and have consequently at all times been a subject of interest to the human race, there is very much, of vast importance, still unknown as to exact causation. As far as mere description is concerned the subject is an easy one to handle, yet there is a remarkable difference, in many cases, between the symptoms and appearances as met in actual practice, and the accounts given in the books. As some one has said: "nothing is so easy to diagnose in the books, and so hard to diagnose in the case." The chief difficulty, of course, is in correctly appreciating etiology; and next, and only second in importance, classification. As to etiology the difficulties, perhaps, are not greater than obtain in other forms of morbid action, but from some cause they have a magnitude apparently greater than ordinary. It is possible that a realization of the importance of correct knowledge, with such direct relation to the welfare of the race, has had much to do with rendering the subject particularly obscure. However that may be, or whatever the true reason, certain it is that there is no subject in the whole catalogue of morbid affections of which the literature is so perplexing and bewildering.

By *venereal diseases* strictly speaking, is meant any malady originating in, or having relation to the sexual act; in a more restricted and conventional sense, it refers to specific contagion from sexual commerce with those who are subjects of specific disease. For purposes of comparison it will be necessary, in

the present chapter to give some attention to at least one form of morbid action that is neither specific nor necessarily venereal. Before doing so, however, it will serve a useful purpose to define "specific" and "contagious," in the sense it is proposed to use the term. A *specific disease* is one that runs the same course, arises always from the same cause, has the same natural history in all cases, varying only in the intensity of some of the symptoms in different cases. It has a relation to contagiousness in that the morbid action may be extended to other unprotected individuals, by means of its products. Under this head would be included not only gonorrhœa, chancroid, and syphilis, but tuberculosis, erysipelas, and many other diseases not essentially surgical in character.

Contagiousness is the property of infecting an organism by contact with some active morbid agent, originating outside of the organism, and communicating the same toxic capacity to the products of the disease. Thus small-pox, glanders, and the specific venereal diseases, may be communicated to an unprotected organism from without, and the products of the disease will excite the same morbid phenomena in another individual, the conditions being favorable, without any abatement in virulence. The term is used, therefore, with the ancient significance, *viz.*, *contact*. Contagion may be immediate or mediate. It is the former when there is direct contact between the original subject, and the recipient, as would occur in sexual commerce. It is *mediate*, when the morbid agent is carried from one to another on articles of clothing, or the toilet, or in some similar way. Generally the potency of the morbid matter has a somewhat definite duration of life, and is influenced to a certain extent by conditions. Some of them are tenacious of life, and will remain potent for a long period when separated from their source. This is notably true of syphilis; less so of gonorrhœa. Heat, acids, strong alkalis, alcohol, and electricity devitalize all of them. Thus we find that certain forms of venereal contagion are more *venereal* than others; that is, they require sexual contact for development, particularly as some of them are chiefly found in the

genital passages. At this time it will be sufficient to note, that gonorrhœa is the most venereal, next chancroid, and least of all syphilis; but as to gravity, the order is reversed, syphilis taking the first rank.

Bearing these definitions in mind, notwithstanding they will not meet with universal acceptance—we are now prepared to take up the study of the different forms of venereal contagion.

NON-SPECIFIC URETHRITIS.

This is an inflammation of the urethra in men, not dependent upon sexual commerce at all, that presents some of the characters of the specific form, so much so that it is a matter of necessity to understand the chief features for purposes of differentiation, if for no other reason. In women the analogous condition is a similar inflammation of the vaginal mucous membrane, the cervix uteri, and possibly the urethra. The essential features of non-specific urethritis are as follows: More or less intense inflammation, running a rapid course, accompanied by a discharge, chiefly mucous in character, and subsiding rapidly in complete resolution, unless often repeated, when resolution becomes more imperfect, and there may be some enduring sequelæ. There are two symptoms of great value, as distinguishing from the specific form, clearly expressed, but often very difficult to determine in practice, *viz.*, absence of incubation, and the confinement of the inflammation to the mucous membrane.

The patient can often trace the commencement of the attack to a definite cause; such as exposure to cold or wet, injury of some kind, or sexual intercourse with one suffering from some form of leucorrhœa, or other vaginal discharge, sometimes a menstrual one. The symptoms of inflammation come on at once, or within a few hours, and rapidly reach a climax. In other cases, masturbation, the use of bougies or catheters, prolonged or frequently repeated sexual intercourse, cystitis, vesical stone, rectal or anal parasites, enlarged prostate, use of certain drinks, as beer, or of drugs such as asparagus, or a thousand and one causes that may irritate the urethra directly

or by contiguity, are provocative of an attack. In all cases, however, there is an absence of an incubatory stage, and in most instances a possibility of connecting the attack with some evident cause. There are many examples, however, particularly in cases arising from long continued irritation, in which a diagnosis seems well nigh impossible, and much injustice may be done the innocent sufferer. As far as therapeutics are concerned, it is a matter of indifference whether the case is specific or otherwise; but to protect others, to say nothing of moral considerations affecting the individual, it is a matter of the utmost importance that a correct diagnosis should be made.

If examination can be had, the mucous membrane will be found swollen, red, irritable, bleeding easily, but soft and pliable, moving freely over the deeper parts; in gonorrhœa it will be hard, leathery, and the sub-mucoid tissues partake in the inflammation, so that the parts seem infiltrated. The sensitiveness and irritability of the urethra make it intolerant of touch, so that strangury or even complete retention of urine occurs; at times this irritability causes spasms of the muscles, which may be exceedingly painful. In the vagina the same general features are marked, the puffy, swollen, red, and irritable mucous membrane being intolerant of touch, often the vulva is swollen and hot, sometimes the glands suppurating. When the urethra is invaded the symptoms are the same as in men. In very many cases, it has been remarked, the inflammation commences deep in the urethra, in the vesical portion—and extends outwards to the meatus, just the reverse of the gonorrhœal development. In my own cases this has always been looked upon as a diagnostic symptom of value, particularly when associated with the character of the discharge, and the feeling of the urethra, through the integument. The discharge is always more mucoid than purulent, sometimes there being no pus-cells, or so few as to be insignificant; the corpus spongiosum feels swollen, it is true, but it is not as hard and leathery as in specific urethritis.

The microscope gives little, if any aid in the diagnosis of non-specific urethritis; the question will be taken up again

later, under gonorrhœa; at this time it will be sufficient to note that the so-called *gonococcus*, at one time supposed to be the specific bacteroid, is now by many thought to be nothing more than a normal element in the vaginal secretions. Should there be an absence of pus-cells in the urethral discharge, the inflammation being of a high grade, the diagnosis would not be difficult; with pus-cells present, particularly in any considerable number, as far as the microscope is concerned the evidence would still be inadequate. It is, therefore, the clinical testimony that is of diagnostic value, and this will be returned to when gonorrhœa is reached.

Treatment is on general homœopathic principles. The symptoms in each case are the only guide, and they differ so widely in different cases, owing to the variety of causes and personal peculiarities, that a full synopsis is impossible. In the majority of cases, however, when the patient applies early for relief, *Aconite* will be found the remedy indicated; in chronic cases, or in late stages, some other remedy will be needed and the student is referred to the treatment of gonorrhœa.

GONORRHOEA.

There is an active controversy going on at this writing, one that has appeared and declined, at uncertain intervals, for many years—as to the nature of gonorrhœa, or as it is otherwise called *clap*, *gonorrhœa virulenta*, or *specific urethritis*. Some esteem it to be at all times non-specific; others that it is just as invariably specific, and a few that the specificity is due to a bacteria, the *gonococcus*. The last I shall dismiss in a few words, and by quoting from J. W. WHITE, M. D. (*Inter. Enc. of Surg.*, II., p. 330, note 1): “At intervals of a few years the doctrine of the dependence of gonorrhœa upon the presence and growth in the urethra of vegetable organisms—bacteria and micrococci—is revived and discussed. NEISSER, SALISBURY, BOKAI, and lately Mr. CHEYNE, Assistant Surgeon to King’s College Hospital, have claimed to base their diagnosis and treatment of the disease upon the existence of these organisms. As their observations

have never been confirmed, except as to the discovery of micrococci such as are found in pus under all circumstances, and wheresoever derived, and as the antisèptic plan of treatment is usually a conspicuous failure in cases of gonorrhœa, it will not be necessary further to allude to these theories." Whilst this expresses my own views fully, and those of the majority of the profession, probably, it will need no elaboration. The same writer, however, in another place (p. 326) uses language which is not to be accepted without debate, and which I quote as a brief summary of the doctrine of the anti-specific party, with which I do not agree. "Those diseases which are called 'specific,' and which are recognized as distinct clinical or pathological entities, or as depending upon definite and invariable sources of origin, have, as a class, certain peculiarities which more or less accurately characterize them; they have a period of incubation intervening between the time of exposure to infection and the outbreak of the first symptoms; they cannot be caused by traumatic influences or by anything except the essential virus of the disease, which, through some channel must find its way into the general circulation; they usually protect from a second attack; they are, in the majority of cases, accompanied by distinctive pathological changes or processes, which distinguish them from disease the result of mere irritative action; they run a definite course, and after their termination or subsidence, cannot be reawakened at will by any known agency. In gonorrhœa, not one of these conditions obtains." Now, on the other hand, I am of the opinion that the specific characters are easily demonstrable, certain precautions being taken to guard against error. Thus, we will admit, that to the non-specific disputant there is a marked difference in the course, intensity, and termination of cases that he indiscriminately calls gonorrhœa; it is here that the opposite party find their data. The virulent cases *are* gonorrhœa; the more benign are *not*. The differences are as marked as in any two kinds of morbid action utterly different in natural history, the sole similarity consisting in there being a more or less purulent discharge from the

genito-urinary canal. For convenience, therefore, I will take up each one of WHITE's essential conditions of specificity, and endeavor to show that they are fully met in gonorrhœa.

1. Our author says a period of incubation is essential to specificity, and certainly in gonorrhœa virulenta this condition is easily fulfilled. A period of from four to ten, or even fourteen days is commonly observed from the time of exposure to efflorescence. There *are* cases, unquestionably, in which the period is shorter, perhaps so short that incubation could be ignored; on the other hand, however, there are a few cases in which it has been prolonged to fourteen days, and even longer. That syphilis is specific, in the most rigid acceptation of the word, none can question, and yet there are cases of undoubted authenticity, in which the incubative stage seemed to be wholly absent. The fact, on this point, seems to be, that the receptivity of the individual has much to do with the length of the incubation as well as the virulence of the contagious element, and the conditions of the surface with which it is brought into contact. On an abraded surface, absorption of syphilitic virus would be so rapid that the incubation would be notably shortened, so much so that a doubt as to diagnosis might arise. There are other instances, outside of the genito-urinary sphere, in which the morbid condition is unquestionably specific, and yet incubation is absent. We are all familiar with cases of variola, and some have met cases of glanders, in which the prodromal symptoms occurred almost immediately upon exposure. As far as this question is concerned, the failure to observe the specific character is due to a neglect to differentiate urethritis. No one will assume that cases of urethritis are of even approximately equal severity, or identical semeiology.

2. A specific disease, we are furthermore assured, cannot arise from traumatism. In a strict use of terms this is true, but actually it is not. Thus a person may have gonorrhœa in an incipient stage, and an accidental irritation may hasten the development. Such occurrences, however, are exceedingly rare, so much so that I have never met an instance. By

stretching the meaning of the term somewhat, the introduction of pus, and its absorption by a mucous surface, is esteemed a species of traumatism. Accepting this, few practitioners have failed to have cases of mild conjunctivitis from contact with pus from neighboring parts, the lachrymal canal; in many more instances the consequences of such contact are frequently negative, no symptoms of any kind being produced. The clinical evidences are utterly opposed to the assumption that purulent inoculation, *per se*, is the essential feature of gonorrhœa. Even should the source of the pus be the genital surfaces, unless the discharge is gonorrhœal nothing more than ordinary irritation will result. This is not mere theory, as any medical practitioner can furnish instances of contact of mucous surfaces with non-specific pus from the genital passages, without any serious consequences, in most cases without any symptoms at all. All have seen cases of ophthalmia neonatorum, of considerable severity, in which the course is, as compared to gonorrhœal ophthalmia, sub-acute, and with none of the rapid destruction of tissue that characterizes the specific form.

3. It is furthermore assumed that in true specific affections, future immunity must be the result. This is one of the rules that are to be proved by the exceptions. It is not necessary to go into this argument at length, there being no lack of clinical testimony as to the repetition of contagious specific diseases, even many repetitions. Syphilis, the most specific of all diseases, has occurred more than once in the same individual, although such an occurrence is admittedly exceedingly rare. No doubt the rule is as stated, but exceptions are plentiful. But there is more than this to be said of the prophylactic character of gonorrhœa. The tissue-changes—as will appear later—are of such a character, that renewed inflammation is easily set up, of such a type withal, that each recurrence adds peculiarly to liability to succeeding attacks. That urethritis is easily induced in those who have had a gonorrhœa is true; it is far from being established that the urethritis thus set up, is of the virulent type.

4. A specific disease, we are also told, must exhibit some distinctive pathological feature. Surely such is eminently the case in gonorrhœa. A non-specific urethritis, no matter how acute or intense its character, can never furnish more than the ordinary characters of inflammation, proportionate to the intensity of the process. The parts are swollen, of course, but it is the soft compressible tumefaction of inflamed soft parts. In gonorrhœa, on the contrary, the parts are deeply affected, hard, almost cartilaginous and "leathery," and slowly regain their normal characteristics. Like all the contagious specific diseases, the contagious principle is in the pus-cell, which, so far, is indistinguishable from other pus-cells. No matter whether the discharge is the thin, serous fluid of the earliest stage, the thick purulent one of the second, or the viscid and albuminous of the last, inoculation is alike followed by gonorrhœa, a fact that does not obtain in ordinary inflammations of these passages. Another specific character to the discharge, is found in the unique manner of its gradual disappearance. In ordinary inflammation, as the discharge diminishes in quantity, it becomes increasingly serous; in gonorrhœa it becomes viscid and gluey. A comparison of the symptoms, to be given in a later paragraph, will show these distinctive pathological characters more clearly.

5. A specific disease must run a definite course, and if this alone were wanting to establish the specificity of gonorrhœa, the condition would be easily met. It will be seen that there are three well-marked stages, the lines of demarcation being clearly defined, and in each stage symptoms unique and pathognomonic. Even the sequelæ are quite characteristic, perhaps not so much in themselves as in their consequences. A gonorrhœal orchitis, for instance, is a much more chronic affair than the traumatic or idiopathic variety, but is chiefly noticeable from its tendency to run over into a sarcocele, or some permanent change of structure, and loss of function.

6. The weakest point in the argument is found in the last statement of *conditio sine qua non*, that the disease (specific) cannot be reawakened by any other agency than the specific

germ. I say this is the weakest part, not because there is absence of clinical evidence, but because the facts obtained are equally potent on either side of the controversy. There has probably been an occasional instance of an attack of urethritis, presumably gonorrhœa, from some cause other than venereal contact; the prevailing mode, however, is from coition. Now here comes the difficulty. The party suspected of communicating the disease, may exhibit none of the symptoms, or even none of the history. The occurrence of the disease is thus accounted for: Either the suspected party has had gonorrhœa, the active symptoms of which have abated; or has recently contracted it, and active symptoms have not appeared; a previous intercourse may have left some gonorrhœal virus in the genital canal; or the second party may have had intercourse with two or more parties, and some of the gonorrhœal virus may have been retained from the earliest. The difficulties experienced in settling such a problem in a given case, are due to the untrustworthy character of the evidence furnished by all the parties concerned, more particularly the one suspected. The possibility of mediate contagion must not be lost sight of.

From an unprejudiced study of the subject, uninfluenced (as far as possible), by the weight of great names, it seems impossible to question the specific character of gonorrhœa; the tendency of the rank and file of the profession, from the very earliest times, has always been to greedily accept novelties, and it is probable—judging the future from the past—that in a few years there will be a reaction from the teachings of to-day, and gonorrhœa restored to its old position, among the specific venereal diseases. At all events I shall treat the subject from that stand-point, my experience affording ample justification for what, at the moment, is no doubt a medical heresy.

Semeiology.—The symptoms, it will be observed readily, fall into three groups or stages. The first is known as the stage of *incubation*, the second, *acute inflammatory*, the third, *chronic inflammatory*.

1. Incubation is marked and unmistakable. From three to five days after exposure, ordinarily, sometimes a longer

period—there will be a sense of heat with some smarting of the meatus, soon followed by slight swelling and itching. On inspection the margins of the orifice will appear tumid, somewhat as though everted, and even in this early stage, hard and firm; urination is somewhat painful, at the meatus, the smarting caused thereby continuing for some time afterward. If the prepuce is long, it will also seem thickened, sensitive and less elastic than common. On making pressure along the urethra, a drop of muco-pus may be pressed out. In women the symptoms are similar, depending upon the part involved; usually all the mucous surfaces, lining the labia, the vagina, and often the urethra are swollen, sensitive and sometimes dry at first, later a scanty muco-purulent discharge. These symptoms will gradually increase in intensity, until about the third day they assume the characters of the second stage.

If the case is seen in this stage, in nine cases out of ten the whole process may be aborted. *Aconite* takes first rank, and in the first twenty-four hours may be considered almost a specific. After this period, some other remedy will be needed, that which has done me the most service being *Apis*. It is the fashion, or was very recently, to treat this stage with weak solutions of *Nitrate of silver*, by injection. In my own practice I think I have learned that such a course will quite surely give unpleasant sequelæ, stricture with long-continued gleet being the most common. Of course the discharge is lessened in amount by such treatment, but it is at the expense of future trouble.

2. **Acute Inflammation** ushers in the second stage, in which the primary symptoms are wonderfully aggravated. The swelling gradually extends backwards along the corpus spongiosum, until at its maximum the urethra feels like a hard solid cord, which seems to be contracted so as to be considerably shorter than normal; it is sensitive to pressure, and painful if any attempt at extension is made. The corpus cavernosum is infiltrated, turgid, and more or less painful; the whole organ is thickened, and apparently shortened. The discharge is profuse, in most cases, the puru-

lent elements predominating over the mucus, yellow in color, not irritating, but with an odor I think eminently *sui generis*. The urine is frequently voided, sometimes with extreme strangury, always with pain, the swollen, narrowed and sensitive urethra giving the sensation as though it were molten metal; late in this stage there may be almost retention, the urine coming in drops, mixed with blood, and causing a most intense suffering. Joined with it all, there is a most intolerable biting-stinging in the urethra, sometimes so intense that it drives the patient distracted. The heat, pain, painful urination, and the urethral itching combine to make the days miserable, and yet the night not unfrequently brings sufferings of its own. After the full establishment of the second stage, when warm in bed, there occur erections of the penis which is curved downwards, as though held with a bridle, causing intense suffering. This is known as *chordee*. It may occur during the day, but for many reasons is more likely to do so at night. As the inflammation extends deeper, there is heat and weight in the perineum, from involvement of the prostate, and occasional extension to the testicles, which will be referred to under the head of sequelæ. The suffering, by day and night, being continuous, the bodily functions soon become deranged; sleep being broken adds to the derangement, so that such patients finally have a worn and haggard expression. In the natural history of the disease, unaffected by remedies, this stage will usually continue a fortnight. In women the second stage may involve all the mucous surfaces, resulting in metritis, endometritis, cystitis, or even, in aggravated cases, through the fallopian tubes, extend to the ovaries, or the pelvic cavity, giving rise to pelvic cellulitis. As a rule gonorrhœa, from the comparative simplicity of the structure of the parts involved, is productive of less suffering than among men; on the other hand, from the extensive surfaces exposed, in aggravated cases the condition is much more grave.

Treatment is far more satisfactory if confined to the indicated remedy; the use of direct medication, no matter in what form applied, in my hands at least, has always been

unsatisfactory, even disastrous. This does not exclude the use of water, of different temperatures as may be desired, or even the application of heat or cold by other means. A very essential part of the treatment, indeed, is cleanliness, as nearly absolute as possible. Remembering the potency of the virus and the possibility of mediate contagion, the articles of the toilet must be out of the reach of others, even to the soap, and washing utensils; all cloths or towels, as well as articles of clothing that have come in contact with the discharges, should be burned. As a rule clear water, without soap, is to be preferred for ablutionary purposes, and from the sensitiveness of the surfaces all harsh treatment must be avoided. The dressings should be frequently changed, as often, in the height of the disease, as once in two hours, or oftener, making it a rule to burn them as soon as removed.

Diet must receive attention. Experience has shown that coffee, tea, alcoholic drinks, highly seasoned or spiced food all have a tendency to aggravate the local symptoms. So also occupation and exercise has a potent influence. Strictly sedentary habits are quite as injurious as too much activity, so that it may require some experiment, in given cases, to determine just how much, and what kind of exercise is beneficial, or rather not hurtful. In the height of the disease there is little question that absolute physical rest is to be preferred.

Therapeutics usually involves the study of a small number of remedies. Conceiving the disease to be specific, according to the teaching of JAHR and others, there should be a specific remedy. I think we have such a one in *Apis*; but as accidental circumstances may give modifications of symptoms, other and secondary remedies may be needed. Those that have done me the best service are; *Apis*, *Arsen.*, *Canth.*, *Rhus.*, *Merc.* or *Bell.*, to these others have added: *Gelsem.*, *Cann. sat.*, *Petrosel.*, *Thuja*.

Apis mel.—For some reason, notwithstanding the abundant clinical records, this remedy is not mentioned in our textbooks. A comparison of its general pathogenesis with the cardinal symptoms of the disease shows an almost complete

parallelism, particularly in the early part of the second stage, and latter portion of the first. There is scanty urination, and puffy œdematous swelling of the parts, but above all the peculiar biting-stinging pain. The discharge is thin, but distinctly purulent, and when the remedy is given at the proper time the disease may be aborted, or its later phenomena materially modified. For some twenty years I have been in the habit of giving this remedy in all cases of gonorrhœa in the suitable stage, and have rarely failed to secure the desired result.

Arsenicum.—This remedy is to be selected when the heat, swelling, and inflammation is intense; the prepuce is swollen and œdematous, and of a dark or livid color; the discharge is scanty, thin, and of bad quality; the urine is scanty, and seems to be boiling hot, or even like melted metal; the sufferings are relieved from warmth, and renewed from the slightest contact with cold. There is a form of gonorrhœa, the *g. sicca*, described by some writers, in which there is no discharge; I have never seen such a case, but admitting the possibility *Arsenic* would symptomatically be the remedy. It is to be thought of in all cases where the turgescence is so great that gangrene seems threatened, and where there is the characteristic Arsenic fever; hot, dry skin, thirst for small quantities, and bodily restlessness.

Belladonna.—In some respects the indications for this remedy resemble Arsenic, but on closer examination they are very different. There is the same intensity of the process, but of a different character. The swelling and inflammation are intense; sensitiveness to touch, scanty discharge but thick and yellow streaked with blood. The sympathetic fever is characteristic, the familiar symptoms, and the aggravations coming on suddenly. There is none of the adynamic character observed under Arsenic, the whole process being decidedly sthenic. Gangrene may occur, but it follows extreme stasis, the scarlet redness changing to a dark purple, and then black. In the Arsenic case the color is never bright red, oftener a brown, or livid hue.

Cannabis sativa.—This remedy has enjoyed a reputation in the treatment of gonorrhœa that, in my experience, it is far from meriting. I have never cured a case with it, although given in all attenuations, and in very many cases; in fact it has never seemed to have any influence whatever. The symptoms given by LILIENTHAL (*Therap.*) are as follows: The urethra feels sore as if drawn up into knots, prepuce greatly swollen and sensitive to the touch; ulcerative soreness of the urethra on touching it; smarting and burning during and after micturition; constant urging with difficult urination; dark redness of the glans and prepuce; priapism, with free mucoid discharge. In women, where there is cutting during micturition between the labia, violent sexual desire, with swelling of the vagina, the orifice of the urethra closed with muco-pus. Urine is voided in a spray. These symptoms are nothing characteristic, but our author tells us the remedy is chiefly indicated "in the premonitory stage, when the discharge is yet thin."

Cantharis.—This remedy is of great value where the retention of urine is extreme, strangury, the urine coming in drops mixed with blood; violent erections, chordee, more or less accompanied by sexual desire. Between these paroxysms, the symptoms are somewhat characteristic; the pain is a sore smarting, as though the urethra were excoriated; the discharge is thin, watery, and ichorous. Cold applications relieve the smarting, and reduce the priapism.

Gelsemium.—This remedy is used empirically, particularly in some of the southern states. Given on indications its pathogenesis is somewhat scanty; pain is severe, and discharge scant; its greatest field of usefulness is in cases of suppression, followed by rheumatism or orchitis.

Petroselinum.—The ordinary symptoms of the second stage, but the biting-stinging is changed to the most intense itching, deep in the urethra, so much so that the patient is tempted to introduce some rough substance for relief.

Stigmata maidis, is a remedy that has a most enthusiastic following just now; if half that is told of it is true, it is almost a specific for gonorrhœa in the acute stage.

Thuja.—Occasionally, late in the second stage, the acute symptoms having mostly subsided, and the discharge become serous, there is a sensation of a drop rolling along the urethra, after or between the acts of micturition; nothing appears at the meatus, however, the sensation being purely subjective. *Thuja* at this time seems to have a highly beneficial effect on the third stage, shortening it materially.

3. Chronic Inflammatory Stage.—This stage commences with a gradual subsidence of the symptoms of acute inflammation, diminished pain, heat, swelling; natural micturition, or but slight irritation attending the act, and usually a lessening of the discharge; there are cases, however, in which the discharge remains profuse, distinctly purulent, while all other acute symptoms disappear. The ordinary duration of this stage may consume two weeks, the discharge diminishing from day to day, becoming less and less purulent, more serous, and ultimately ceasing entirely, leaving the parts, as far as ordinary inspection will determine, pretty much as they were originally. On more careful and minute inspection, there will be found notable change in the tissues, due to the plastic infiltration they have been subjected to; they will be thicker, firmer, and with evidences of specific inflammation which will very slowly and imperfectly disappear; in some cases, it is probable, some traces of the disease may continue during life.

Treatment, in general, will be a simple continuation of the remedy used in the second stage. Occasionally some other remedy will be needed, usually one of the following.

Hydrastis, when the discharge continues profuse, the other symptoms of acute inflammation having passed away. This remedy, by the way, is a very useful one in cases of frequently repeated gonorrhœa, in which the acute symptoms are always modified.

Pulsatilla, where the discharge remains quite profuse, is yellow or greenish, and there is smarting in the urethra relieved by cold applications.

Alumina, there is no pain, soreness, or any difficulty in urinating, but the discharge loses its purulent character, becoming albuminous and stringy.

Sulphur, has a formication in the urethra, sometimes with a scanty, intermittent, watery discharge.

In probably the majority of cases of gonorrhœa, taking all kinds together, the third stage has a very imperfect termination, if indeed it may be said to have any termination at all. It degenerates into a condition of *Gleet*, which is characterized by a slight discharge, hardly noticeable, in the majority of instances, but which causes much annoyance. This may continue for months, or even years. The discharge may be a mere drop or two in twenty-four hours, sometimes not appearing as a fluid, but as a dried film, closing the meatus. In itself it has little significance, and causes no inconvenience, but it is associated with a serious lesion deeper in the parts, *viz.*, a stricture. Occasion will be had to return to this later, at this time it is sufficient to call attention to the fact.

Treatment of gleet is very unsatisfactory. Recognizing the fact that gleet is a symptom of stricture, and stricture, as a sequence to gonorrhœa being almost always cicatricial or its equivalent, fibrinous infiltration, *Silicea* would first occur to one who has had much experience in surgical practice. In fact it takes first rank, from all considerations. *Argentum nit.* occupies second place, and perhaps *Sulph.* would be useful in certain cases. One of these remedies is certainly indicated, in every case. The popular method of treatment is the use of solid steel bougies, which have a certain application from the occasional cure of the stricture. The great danger is, that the dilatation of the urethra is sometimes carried too far, and the function of the organ impaired correspondingly. If the practitioner can guard himself against this over dilatation, certainly the bougie is a valuable instrument.

Complications and Sequelæ.—The majority of the complications of gonorrhœa, are purely accidental in character, or due to the intensity of the morbid action, not its specificity. Thus we find in cases of great severity, *lymphangitis*, extending to the inguinal glands as “bubo.” *Phimosis*, when the prepuce is long, from swelling and infiltration; *para-phimosis*, under opposite conditions, either from swelling of the prepuce,

or of the glans; *balanitis*, or inflammation of the glans; *prostatitis*, acute or chronic; *hæmorrhage*, from rupture of small vessels in the urethra; *ulceration* of the urethra, from general causes; *laceration* of the urethra, from forcibly straightening the penis in *chordee*, a practice of the ignorant; *fracture* of the corpus cavernosum, from the same causes, besides others of a similar character. There are other complications and sequelæ that have a different complexion, and call for more extended notice.

Herpes Preputialis is a not uncommon complication, but from its association with gonorrhœa presents some peculiar features. It commences, like all herpetic eruptions, with the appearance of red spots, on the internal or external surface of the prepuce, soon, in many cases, extending to the glans, on which appear minute vesicles, in groups of from two to four, which break, in a day or two, but then lose, to some extent, the ordinary characters of herpes. The discharge soon becomes purulent, the red spots coalesce, the broken vesicles leave patches of erosion that have a tendency to run together, and in some cases even become transformed into ulcers. In some cases the ulceration is very extensive, which from the associated local disturbance makes recovery very tedious, and may even result in gangrene and sloughing. There are many cases that bear such a strong resemblance to syphilitic chancre that serious mischief has resulted from the energetic treatment to which some heroic routinists are partial. I have seen most formidable cases, cases in which recovery was only secured with some lasting deformity. One case was sent to my clinic, some years ago, the letter of introduction stating it to be a "typical one of syphilis." The treatment had been *Mercury*, to the extent of salivation, and calomel topically: the case looked like one of chancroidal phagedæna, and it was only the remarkably clear history that enabled a diagnosis to be made. Such aggravated cases are very difficult to treat, and call for the utmost patience and confidence on the part of the sufferer. Simple *Herpes*, which preserves the typical characters, is easily subdued, but these complicated

cases, even when not maltreated, as so many are, probably do better on *Rhus* or *Sulphur* than any single remedy. *Arsenic* would be indicated when gangrenous symptoms arose. I have found *Calendula*, topically or otherwise, of benefit when the morbid action was arrested, and the ulcers were slow to heal.

Orchitis and Epididymitis, inflammation of the testicle and epididymus respectively, are treated clinically as the same affection, and indeed the one is simply a further development of the other. The symptoms are quite similar, and while for therapeutic purposes it may not be essential to establish a perfect differentiation, yet for purposes of prognosis it is very important to do so. There are a variety of opinions as to the manner in which the epididymus or testicle becomes implicated in the gonorrhœal inflammation, the most plausible, and the one most in harmony with the theory of the specific nature of the malady, being that the inflammation extends "along the ejaculatory ducts and spermatic canals" to the epididymus, and thence, at times to the testicle. In cases of traumatism, of course the injury is the direct cause, and while the semeiology may be very similar, the pathology, and the consequences, I think, are very different. It goes without saying, that inflammation of these structures may occur from a variety of causes; cold, direct injury, and excessive or violent sexual commerce, furnishing many cases. The majority of these affections, however, have a direct causative relation to gonorrhœa. The first symptoms usually appear about the fifth or sixth week, about the time that the second stage approaches its close. The patient will first complain of some sensitiveness and feeling of dragging in the inguinal region, usually on the left side—with perhaps some fullness at the upper part of the cord, just after it passes out of the inguinal canal. On seizing the cord between the finger and thumb, and gently rolling it, the vas deferens will be found swollen, sometimes very little if any, but usually two or three times its ordinary dimensions, and sensitive; there may not be a positive pain, but that peculiar faint, nauseous sensation felt when the testicle is

compressed. Soon the scrotum commences to swell, and becomes retracted, assuming a dark, somewhat smooth appearance, occasionally a bright red—and hot to the hand; sensitiveness increasing with the augmentation in size, until finally, the pain is constant, whether the parts are touched or not, the weight gives a sensation of dragging, there is feverishness, and later the recumbent position is the only one that can be borne at all. The swelling may be anything from an orange to a large cocoanut. The pain and dragging are so severe when standing or sitting, and jars, or contact increase them to such a degree, that lying down, with the scrotum suspended in some sort of sling becomes a necessity. Even when lying down, the trunk is bent forward, and the knees drawn up to diminish the tension, and to avoid contact or compression the knees are kept widely separated. Laughing, coughing, the shaking of the bed, or any movement of the body cause so much pain, that the patient dreads the approach of anyone, or their moving about the room. In most of the cases I have seen the scrotum becomes more or less covered by a vesicular eruption, sometimes smarting to an extent that seriously adds to the discomfort. The duration of an attack is uncertain; I have known cases to recover in a week, and others require two or three months; perhaps the average will be, from first to last, three weeks.

There may be a question, particularly in traumatic cases, whether it is a hæmatocele, or hernia, but the diagnosis is generally sufficiently easy from a consideration of the extreme and peculiar pain, and the enlarged epididymus. Furthermore, hæmatocele and hernia, are both developed soon after (immediately in fact) the reception of injury, whereas the epididymitis or orchitis come on more slowly, and are much more tardy in reaching full development.

A question as to termination, as related to cause more particularly, will claim close attention, and I think the doctrine of the specificity of gonorrhœa here receives much support. The case being purely traumatic, the result will be as in non-specific inflammation in general; that is, the intensity of the

process determines the result. In ordinary cases resolution leaves the parts substantially normal from the products of the process being absorbed. In higher grades of intensity, suppuration may ensue, and if the part escapes complete destruction, cicatricial repair endangers its integrity from atrophy. The same results are observed in the non-specific forms, non-traumatic in character, perhaps the danger of suppuration is much less. In the gonorrhœal forms, however, a much different history is observed. Complete resolution may be said never to occur, and suppuration with extreme rarity. The most common termination is in a slow retrocession, with a permanent enlargement of the globus minor, feeling like a hard cartilaginous button. In other cases the ducts are permanently closed, the accumulation of seminal fluids forming a "spermatic cyst." In still others, when the testicle is involved, there will be an imperfect subsidence of the swelling, a sarcocele remaining, which on proper provocation may readily pass into some distinct form of tumor. In a few instances I have seen atrophy of the testicle supervene, in one case it almost completely disappeared. This difference in results must necessarily be due to differences in the process; one case, the idiopathic, represents the typical course of inflammatory action; the other represents a formative or constructive action, characteristic of specific disease. It would not be true to refer all cases of sarcocele to gonorrhœal orchitis; but it is true that gonorrhœal swelled testicle determines a permanent change in the organ that peculiarly predisposes it to extensive tissue-change on slight provocation.

Treatment must be medicinal and adjuvant. The latter begins and ends, I think, in providing proper support for the organ, such as a sling or suspensory bandage and does not include any compression, which I have come to consider a serious error, *i. e.*, serious in its results. I can give no reason for this opinion beyond my clinical experience, which would seem to be somewhat different from that of practitioners in other schools of therapeutics. The remedies are to be selected as though there were no question of specificity, solely on the

indications, but do not, in my experience, include a very large number.

Belladonna is called for when the pain, heat, and swelling are acute, the surface smooth and red, sensitive to the least touch, or jar of the floor; fever high, of the synochal type, and the general symptoms so quickly recognized.

Phytolacca takes first rank when the acute symptoms abate but the swelling is tardy in going down, or shows no disposition to abate.

Rhus tox. is indicated in cases with much vesicular eruption, dark redness of the part, constantly changing the position, and the fever has a tendency to assume typhoid characters.

Silicea has done me good service in one or two cases in which the former remedy produced no effect, the testicle remaining swollen after all acute symptoms had disappeared.

Conium has likewise been useful, particularly where the weight was extreme, as from a stone.

Aurum fol. is indicated where the course of the disease is chronic, and the peculiar suicidal melancholy obtains.

Iodine has seemed to arrest threatened atrophy, in one case even securing a normal development of what seemed to be a hopelessly lost gland.

Pulsatilla has a reputation of particular relation to orchitis, but has never given me any satisfaction. The indications for its use, as far as objectivity are concerned, are not marked.

Arnica takes the first rank in traumatic cases, particularly from contusions, unless suppuration threatens, when remedies will be called for as in suppuration in general. When pus has once formed, it must be evacuated precisely as for abscess elsewhere.

Gonorrhœal Rheumatism.—In an earlier paragraph I had occasion to refer to the article on gonorrhœa by L. W. WHITE, M. D. (*Int. Cycl. of Surgery*, II., 325), calling attention to his views as to the specific character of the disease. When he reaches rheumatism (p. 346), he uses the following remarkable language: "There is no discoverable connection between

this form of rheumatism and any tendency, hereditary or acquired, to rheumatic disease; my own experience has amply convinced me of this fact. Besides, as will be seen, there are broad distinctions between this disease and ordinary rheumatism." This is remarkable language from a man who a few pages back denied that gonorrhœa had any peculiar and definite pathology, which it should have to entitle it to classification among the specific diseases! He attempts to account for it on the theory of septic infection, but it would be a difficult matter to show its semeiologic relationship to septicæmia from other sources. The peculiarities are, that the symptoms only appear during the height of the disease, when the purulent discharge is profuse; it attacks men, in preference to women; the trouble is always in a joint, sometimes one, at others several; there is great and rapid synovial accumulation, and no constitutional symptoms as a rule. The case is more one of acute arthritis, than rheumatism. The symptoms usually arise suddenly, rapidly reach their maximum, the joint being hot, swollen and exquisitely sensitive, and ordinarily rapidly subsides. If such a case were seen without accompanying gonorrhœa, it would attract attention from the speedy establishment, rapid development, and equally rapid decline. While the rule is a speedy subsidence of the acute symptoms, yet there is a marked tendency to hydrarthrosis, which may continue for a long time.

Our author, as *one proof* (!) of its difference from the ordinary rheumatism says: "Anti-rheumatic remedies are unavailing." Now, for our part, the reverse is true, for the "anti-rheumatic remedies" are positively, promptly, curative. *Rhus*, *Bry.*, and *Arsenic* will rarely disappoint, particularly if there is no prejudice against the 30th attenuation or even higher.

Gonorrhœal Ophthalmia and Conjunctivitis.—Of late years I have studiously avoided the treatment of ophthalmic cases of all kinds, having reached the conclusion that they are eminently "special" in character. I accordingly crave indulgence for a liberal quotation from the article of Dr. WHITE

(*loc. cit.*) who gives a most admirable condensed account of this most formidable complication. I prefer a *condensed* account, as I wish to discourage the general practitioner from attempting to treat such cases, unless he is so situated that he cannot do otherwise. He says (p. 348): "Associated with these joint troubles in many cases, or occasionally occurring as the only complication of a urethritis, there is an inflammation of some of the structures of the eye, known as *gonorrhœal ophthalmia*. The sclerotic coat, the iris, the oculo-palpebral conjunctiva are the tissues chiefly affected—the symptoms being those of a common iritis or conjunctivitis, attended with considerable aching pain, and accompanied by only a moderate amount of muco-purulent discharge. The usual remedies have a beneficial effect, but the disease tends to run a rather chronic course, and finally to subside spontaneously." It will be observed that this is not due to inoculation with the urethral discharge, a fact which must be emphasized by those who claim specific characters in gonorrhœa.

"This complication should not be confused with the very different and much more serious condition of *gonorrhœal conjunctivitis*, although they are often spoken of as identical. The latter trouble is the result always of direct inoculation, the pus being transferred by the finger or otherwise to the edge or inside surface of the lids. The symptoms commonly make their appearance within a few hours, and are at first like those of a simple catarrhal conjunctivitis. They increase, however, with almost incredible rapidity, so that an eye which twenty-four hours previously was entirely healthy, will be found with tense, swollen, œdematous, bulging, erysipelatous-looking lids, from between the closely approximated edges of which a thick purulent secretion is oozing; on separating them the conjunctiva is found injected and chemosed, and bathed in pus. In a short time if the chemosis is not relieved, the supply of blood being cut off from the cornea, the latter ulcerates in one or more spots, or may become detached and fall out entirely, permitting a complete loss of the contents of the globe. The whole series of phenomena may occur within

three or four days, and not infrequently has occupied only half that time. The pus from such an inflammation is intensely contagious, irritates the cheeks over which it flows, and will, to a certainty, affect the sound eye, if any be allowed to come in contact with it.

"It is of great importance, from the very onset of the disease, it should be distinguished from the mild, self-curable affection which we have described. The main points of difference are contained in the following table:

"GONORRHOËAL CONJUNCTIVITIS.	"GONORRHOËAL OPHTHALMIA.
Produced by contagion only.	Produced probably by septicæmic infection. (?) Has no relation to direct contagion.
Occurs once in seven hundred or eight hundred cases of gonorrhœa.	Occurs once in fifty or sixty cases.
May be derived from a second person, by pus inoculation.	Can only occur in a person having urethri is.
Involves one eye primarily.	Involves both eyes usually.
Remains limited to eye originally affected, unless the other is accidentally inoculated.	Frequently passes from one eye to the other.
Symptoms affect the conjunctiva from the start.	Symptoms affect the fibrinous tissues, the sclerotic coat and the iris.
Symptoms of greatest gravity and urgency.	Symptoms mild, sub-acute.
No association with subsequent gonorrhœa.	Frequently returns with each later attack of gonorrhœa.
No relation to joint trouble, or other rheumatic affections.	Most commonly found to coëxist with some other form of gonorrhœal rheumatism.
Tendency to rapid destruction of tissue involved.	Tendency to final but slow cure.
Treatment very useful; should be prompt and energetic."	Treatment not very effective; should be mild and expectant."

The above brief account is as much as can be useful in a book not concerned with ophthalmic medicine; the fact of malignancy, and rapid destruction of the tissues needs emphasizing, and cannot be dwelt upon too strongly. The loss of an hour in the commencement may easily doom the eye to destruction.

Treatment must consequently be prompt, *vigorous* and thorough. The first item is absolute cleanliness, and protection of the sound eye. These two items are placed together as one, because careless cleansing may inoculate the sound eye. The lids being tightly closed ordinary ablution will be ineffective; they must be gently separated, and the accumulated pus washed out, by means of a small syringe made for the purpose. Preliminary to this the sound eye should be closed, to guard against accident, either by a strip of adhesive plaster, or something equally efficacious. This cleansing should be done at intervals of twenty minutes, or half an hour; in severe cases perhaps oftener, the utmost gentleness being used, to avoid all unnecessary irritation. The syringe should be thoroughly cleansed immediately after using, and all cloths, cotton, sponges, pieces of muslin, or other articles that have come in contact with the discharge, must be burnt. This last should be scrupulously attended to; all such material must be *burnt at once*, not laid aside for future attention, or thrown into vaults, ash-pile, or buried. Fire is the only treatment. As to treatment by remedies, Drs. ALLEN and NORTON (*Ophth. Therap.*, p. 181), say: "*Argentum nit.* This is the remedy, *par excellence* for all forms of purulent ophthalmia. We have witnessed the most intense chemosis with strangulated vessels, most profuse purulent discharge and commencing haziness of cornea with a tendency to slough, subside rapidly under this remedy, internally administered. We believe there is no need of cauterization; but that all the beneficial results may be obtained by its use in the potencies. The subjective symptoms are almost none. Their very absence, with the profuse purulent discharge and swollen lids, swollen from being distended by a collection of pus in the eye, or from swelling of the sub-conjunctival tissues and not from infiltration of the connective tissues of the lids themselves (as in Rhus or Apis) indicates the drug.

"By its employment as a cauterizing agent, as used by the old school, there is no doubt that many cases of purulent conjunctivitis are cured, though with risk to the cornea, as is

attested by the results of this treatment. These sad results, *viz.*, perforation of cornea, dense leucoma, etc., we claim are, to a great extent, averted by the use of the remedy in the potencies, either internally alone or both internally and externally. We are in the habit of using the thirtieth potency internally, and, at the same time, a solution of five or ten grains to two drams of water of the first, third, or thirtieth dilution as an external application, all the time taking care to ensure cleanliness; and we have yet to see the first case go on to destruction of the cornea."

Other remedies may be needed, for some modification of the malady, such as *Arsenic*, or *Rhus*, or *Merc.*, yet few cases will resist the action of the *Argentum*. While so much stress has been laid on protection of the sound eye, it would seem unnecessary to call attention to protection of the eyes of the nurse, physician, and others having to do with the patient. The most extreme caution must be exercised in thoroughly cleansing the hands, and avoiding contact with any article of clothing or dressing, or appliances of all kinds that may have had contact with the pus.

Stricture.—Unquestionably one of the most serious results of gonorrhœa, is stricture of the urethra. The subject is one of such magnitude, and of such importance from therapeutic considerations, that a chapter could easily be devoted to its consideration. As a work on pathology, with only passing reference to therapeutics, the space disposable compels brevity. The word *stricture* means a constriction or narrowing of the diameter of a canal; in practice it means something more than this, *viz.*, a loss of expulsive power. The urine is expelled by an association of forces all of which, and in due proportion, are essential to the perfect performance of the act; the failure or insufficiency of any one of them, must cause at least a functional impairment, and in most cases even more than this. These forces are the contraction of the abdominal muscles, of the muscular fibres of the bladder, and of those of the urethra. The urethral fibres, and the perineal muscles concerned in the act of urination must be relaxed in the begin-

ning contracting again at the close, to empty the urethra. We learn from this that the urethra does not play a purely passive part in micturition; it is an active participant, and one of some considerable potency. To convert it into a simple tube, a waste pipe, will either render the whole act of urination imperfect, some urine being retained in the urethra, or flowing back into the bladder—or its failure will devolve additional effort in the other forces, which not only exposes them to injury, but even then leaves urine in the urethra that cannot be expelled by *any* force. Thus we find a stricture, pathologically considered, is a loss of muscularity, as well as a diminution of calibre; in fact the mere reduction of calibre is a comparatively unimportant consideration. The stricture has its origin in a plastic infiltration, or rather organization, in the mucous and sub-mucoid tissues, causing a narrowing of the lumen of the canal; or in an ulcer or erosion, which healing by cicatrization, causes a contraction and thickening at the same time. Like all such processes, wherever found, once commenced they remain as permanent defects, and the peculiar property of contraction induces a constantly diminishing capacity of the urethra. They induce, also, an irritation amounting to a sub-acute inflammation, which gives rise to the gleety discharge before alluded to, and also causes a spasmodic irritability in the muscular fibres in the neighborhood. The urine is now expelled with great difficulty, partly from the narrowing of the canal and the increased friction occasioned thereby, and partly by the loss of the peristaltic action of the tube itself. The difficulties increase, as time goes on, the stricture becoming, as the saying is, tighter and tighter, until in extreme cases the opening is so minute that it is only with the most extreme and painful effort that the bladder can be emptied at all. This constant straining often induces abdominal hernia, or even aneurysm, so that the consequences are not by any means confined to a simple impediment to urination. In the commencement, the patient will complain of delay in starting the stream of urine, feebleness of impulse, and dribbling of urine for some little time after the

act. Later the stream will assume a variety of abnormal shapes. spiral, fan-shaped and the like, and at times, particularly on exposure to cold, to over exertion, or from some indiscretion in eating or drinking (particularly the use of alcoholic stimulants), there will be strangury or retention of urine from spasmodic contraction of the irritable muscular fibres. In the natural history of a case, the stricture will finally become so tight that it is almost impossible to pass water at all, and then only after numerous painful efforts, with severe straining sometimes for hours. The nights are sleepless, from the frequent ineffectual urging to urinate, and soon the general health becomes impaired. The troubles do not cease here, unfortunately. The retained urine in the urethra undergoes decomposition, the constant irritation and inflammation induces other deposits similar to the original, and additional strictures may form, which go through the same history of development, and add to the existing difficulties. In very extreme cases, the urine is retained, threatening the kidneys (*choking* them) and pyo- or hydro-nephrosis results, with death as the almost inevitable sequelæ. In some cases again, abscess may occur deep in the urinary canal, and pointing on the perineum, or elsewhere, establish a urinary fistula which renders life almost unendurable. Such is the natural history of stricture, and it needs nothing more to indicate the symptomatic value and significance of gleet, so lightly regarded by too many practitioners.

Strictures are readily divided into two general kinds, those of large, and those of small calibre. The latter always begin as the former; they are a simple development of the former. The mere existence of gleet is a legitimate cause for suspicion, and the stricture must be sought for. The *olivary sound* (*sonds a boulic*, of OTIS) are the only instruments, known to me that are at all satisfactory for diagnostic purposes. They are furnished in sets, and not only show at once the existence of stricture, but its location, length, size and character, *i. e.*, whether hard or soft. Having determined these facts, some intelligent conception can be formed of the indications for treatment.

Treatment is almost from the necessities of the case, instrumental. In the commencement, when gleet is first observed, the remedies mentioned under that head will often prove curative. Later, however, when the stricture is well developed, remedies alone, I am forced to conclude, are utterly inoperative. Conjoined with other treatment, *and only then*, I have found *Silicea* the only remedy that has the slightest influence; for the spasmodic closure of the urethra, *Nux vom.* or *Canth.* are useful, but the organic stricture must come within the domain of the surgeon solely. The plan of this work does not contemplate more than a reference to purely mechanical therapeutics, therefore the subject must be dismissed with the mere list of procedures, in the order in which I have found them valuable. Galvanism, dilatation, internal urethrotomy, external urethrotomy, and divulsion, which last I include in deference to custom alone, esteeming it to be not only valueless, but barbarous and hurtful.

CHANCROID.

In former times syphilis was supposed to exist in two forms, the primary lesion, or the ulcer, indicating the form; *soft chancre*, as it was called, being recognized as a non-infecting sore, that is the morbid action ceased with its disappearance; the *hard or Hunterian chancre* was only the commencement of later and more serious trouble. As time went on, and facilities for the minute study of the tissue-changes became perfected, the conviction gained ground that the conditions were dissimilar, had no relation to each other apart from a common venereal origin, and that the contagious principle was consequently totally different. The present teaching, with a few notable exceptions, is that the diseases represented by these two forms of ulceration, are as distinct as any two totally unlike morbid actions can be. This doctrine is known as the *dualistic*; that which assumes an identity in the processes, modified by accidental circumstances, is known as the *unicistic*. There are a number of excellent authorities on the unicistic side of the controversy, but the larger number of teachers,

writers, practitioners with enlarged opportunities for comparison, are ranged on the opposite side. I shall attempt no argument, the subject being worn somewhat threadbare, believing a plain statement of the symptomological differences will fully sustain the position taken. At the same time, I am compelled to say, the differences are often more pronounced in print than in actual practice, so many circumstances combining to obscure and complicate the characteristics. The sources of error in diagnosis, are many, and formidable; insufficient or untrustworthy history of the case; changes in the objectivity from accidental complications, as inflammation; improper treatment adding drug symptoms to those of disease; renewed exposure to venereal contagion, and a mixture of the two forms of disease resulting; some constitutional dyscrasia or diathesis, and many others, often operate to produce a state of facts that readily mislead even those who may be considered of first-class attainments. Nevertheless, there are certain essential symptoms, in each form of disease, rarely so completely obscured that they escape recognition, and these I shall endeavor to present in a manner that will fix them in the memory, and at the same time emphasize the systematic differences.

The ancient *soft chancre*, or "non-infecting sore," is now universally known as *chancroid*. The general characters are well given by Surgeon P. H. BAILHACHE, U. S. Marine Hospital Service (*Report* for 1875, p. 162). He says: "*Chancroid* is a contagious, acute, local disease, not peculiar to the human race, the result of a local poison, introduced by actual contact of a denuded (or possibly of an epithelial) surface with the purulent secretion of a venereal soft chancre or virulent bubo—the most common means of contagion being through sexual intercourse. Chancroid first manifests itself by one or more lesions at the point of contact, which lesions have a tendency to destructive ulceration. A *pustule*, revealing itself within twenty-four or forty-eight hours after exposure, and rapidly developing into a soft chancre *without any period of incubation*, characterizes the inception of the disease, which may or may not be followed by sympathetic or virulent bubo.

The purulent secretions of soft chancres and virulent buboes, are indefinitely auto-inoculable; but uncomplicated chancroidal lesions are never followed by constitutional (specific) disease."

The first distinguishing feature of chancroid, is the absence of any incubation, some indication of infection appearing almost immediately upon exposure, certainly within a very few hours. The initial lesion is oftener found on the genitals, inasmuch as the disease is very venereal, but may be found on any part of the body, in any tissue, pathological as well as physiological. The sole condition of infection, after exposure, is that the virus shall come in contact with a surface capable of absorption, either from its physiological character (as a mucous surface), or abrasion of an ordinary cuticular one. Prolonged contact with the pus, however, as might occur where it was contained in a fold of the skin, particularly if the surfaces were subjected to friction on each other, would determine absorption through the skin. Thus the commoner locality will be the preputial frænum, the corona glandis, almost any part of the genital apparatus of women, or the folds in the groin, nates, or elsewhere in that region. The heat and friction combined, when the lodgment is cuticular, will soon produce erosion, and thus the conditions of absorption are created. The only equivalent for incubation, therefore, is the time required for absorption; immediately upon this occurrence symptoms are produced. It is conceivable that in a person of filthy habits, a drop of chancroidal pus might remain in contact with a thick cuticular surface sufficiently long to give an appearance of incubation, and possibly render a diagnosis uncertain. Hence the part affected, and the character of the individual might assume importance as diagnostic factors.

Soon after absorption, almost immediately, there will appear a red spot, rapidly developing into a pustule, surrounded by an inflamed areola of varying size—sometimes there will be two or even more pustules arising on the same spot, or close together. The areola and base are not indurated, in the sense

of syphilitic induration, but firm, shading off imperceptibly into the surrounding parts, like any inflammatory action. There is considerable pain, and the whole process is of a character to call attention to it, so that it cannot pass unnoticed. A distinguishing feature can now be observed: The pus is auto-inoculable, that is wherever deposited, infection follows. The body may be inoculated in any part, and any number of times, and chancroidal pustules will follow. This is not so in syphilis.

Shortly the pustule will break, revealing an ulcer, that as compared to syphilis, has prominent characteristics. The edges are sharp-cut, the outline irregular; frequently the edges are undermined, sometimes inverted, never (or rarely) elevated, the floor is uneven, "worm-eaten," dull color, or covered with a yellowish, or brown slough. There is considerable pain, profuse discharge of pus, a wide areola, and rapid development, with slow repair. The characteristic features are, first the auto-inoculability of the discharge, and second the destructive character of the process, as shown by microscopic examination of the product. The pus is filled with detritus, and there is no sign of construction discoverable. The inocubility has the effect to produce new pustules and ulcers, wherever the pus may lodge and be retained, thus giving a succession of ulcerations, of differing ages, which is something so unique and characteristic that when satisfactorily established the fact alone must be considered conclusive evidence. The ulcer easily takes on gangrenous characters, and may produce the most extensive destruction of tissue; I have seen such an ulcer involving the perineum, one labium, most of the mons veneris, and extending over the abdomen half way to the umbilicus. Such an extensive loss of substance is, of course, only observed in exceptional cases; in those of uncleanly habits there may be no limit to size or number of ulcerations; in those more careful in their habits, and who are warned of the consequences of neglect, subsequent ulcers may not occur. Under all circumstances, the cicatrix is a prominent one, usually somewhat depressed, white, and of the gen-

eral characters of the vaccination scar. There may be a certain amount of induration accompanying the ulcer, but it will be such as accompanies inflammation in general.

The features that may be considered pathognomonic of chancroid, can now be tabulated, and when compared with those of syphilis, will be found as different as two unlike things can well be. For purposes of ready comparison this tabulation will be deferred until Syphilis has been described.

Bubo, or enlargement of the inguinal, or other glands, is a common occurrence, but not at all constant. When it occurs the swelling is notably inflammatory, painful, suppurating, and acute as a rule. Ordinarily but a single gland is affected, rarely more than two. The discharge has the same character as the pus from the pustule and ulcer, *viz.*, auto-inoculability. In some cases, for reasons not understood, it occasionally happens that a discharging bubo fails to heal, and may continue for an indefinite time, even a year or more.

There are some other features to be considered, some of which are not in harmony with the specific theory of the disease, and in so far may be esteemed conclusive proof as to its being non-syphilitic. The disease is never transmitted by heredity, nor any disposition to it. As far as known there are no conditions of body that will prevent contagion if the conditions are favorable. It is not prophylactic, as one attack does not in any way protect the individual from subsequent ones; indeed renewed infection may occur indefinitely during the existence of one outbreak. The effects are purely local, there being no symptoms of a disturbance of health, in any constant form at least, during the attack, such intercurrent symptoms as may arise being of a purely general character, not in any way, cause, progress, or decline—being influenced by the chancroidal disease. There may be, it is true, some irritative fever, but nothing different from what might arise from any local affection of similar intensity. The sole indications of specificity, are that the pustule and ulcer always follow inoculation with the pus, that pus from no other source will have similar effects, and that no other agent than the chancroidal pus will develop the chancroidal disease.

Chancroid seems to be a disease of the lower classes; it is more common, according to the authorities, in hospital practice, than syphilis. The latter is eminently a disease of the higher classes, at least as far as the initial lesions are concerned. This is due to the inconspicuousness of the syphilitic chancre, in most cases not producing symptoms sufficiently obtrusive to attract the attention of those who are likely to consort with the abandoned creatures, of either sex, who would seek or permit sexual commerce during the existence of such a loathsome disease as chancroid. Among public women who have not yet reached the lowest depths of depravity, and are young in their ignoble calling, the occurrence of the slightest pimple or abrasion, or tenderness would prompt them to seek medical advice; so also with their male companions, who must necessarily be of the higher social scale. Among more degraded men and women, it must be a pronounced affection that would compel them to seek medical aid. So it happens, that while the later stages of syphilis may be as common in one class of society as the other, yet the initial lesion is oftener seen among the better classes.

What has been said above will have failed in its purpose if the fact of distinctive, unique, and pathognomonic features are not plainly apparent. In an uncomplicated case, a diagnosis is easy; the reverse is true under opposite conditions. Unfortunately there are many in the practice of medicine, who failing to recognize these distinguishing features in their incipency, create complications by injudicious treatment; the possibility of a syphilitic contracting chancroid, or one with chancroid, incredible as it may appear—contracting syphilis, also gives us cases of so-called “mixed-chancre,” in which some of the characters of both diseases appear. The use of astringents, and caustics, in the first place, may diminish a discharge, arrest a destructive action, and produce an induration that may resemble syphilis; in the second, the confusion is owing to the fact that both diseases do exist. The test is not a difficult one. Inoculation, of some other part of the body will surely reproduce the ulcer, if it is chancroid, and produce

no result if syphilitic. If doubt still exists, and the history is untrustworthy, the case had better be treated as syphilitic, even if the chancroidal disease is aggravated, as the syphilis is the element in the case to be feared.

Treatment.—A study of the conditions of contagion, as far the characters of the pus is concerned, has established the fact that the specific virility may be destroyed by various agents, notably heat and acids. Clinical testimony is abundant, and unquestionable, that the topical treatment of the ulcer by these agents, used judiciously, converts the venereal sore into an ordinary ulcer. There are unquestionably cases of chancroid that have been cured by remedies administered in the ordinary manner, but the time consumed, and the clinical history of such cases as have been fully reported leads one to question, after all, whether the treatment had anything to do with the results, *when the diagnosis was correct*; not a few cases, that have found their way into print, seem to have been herpes preputialis, and thus led to innumerable false deductions, repeated over and over again in our textbooks.

The first thing to be done, therefore, in all cases, is to convert the specific sore into a non-specific ulcer by cauterization. Nitrate of silver will not do this, as its action is superficial in the solid form; Nitric acid is to be preferred. Dipping a stick, such as a match, into the acid, and touching with it the ulcers, until all parts are evidently cauterized, is the best way, as thus the acid reaches all parts of the surface. The good effects are more promptly observed in the case of pustules, or ulcers in the earlier stages. The success of the process may be determined by inoculating the integument, and observing the effects; should a pustule form, the treatment has not been effectual, and must be repeated, the inoculation-pustule being freely cauterized at the same time. As soon as the pus ceases to produce the characteristic pustule, the ulcer may be considered an ordinary idiopathic one, and treated as ulcers in general. *Calendula*, in the absence of special indications, has acted promptly in my hands.

It is of the utmost importance that care be taken to avoid the lodgment of the pus where it may excite a new development; for this purpose cleanliness is of the first value, and the destruction of all soiled articles of dressing, or clothing, *by fire*. The hands of the patient, attendants, and physician must be scrupulously looked after, to guard against infection of their own persons, as well as of others with whom they may come into contact. Under the most favorable circumstances the course of the disease will be slow, and call for close individualization in the selection of remedies. The indications for remedies will be found in an earlier chapter, *Ulceration*.

The *bubo* is to be opened freely, as soon as pus is detected, like any acute abscess, and the formation of pus hastened by poultices and *Hepar sulph.* When opened, the bubo must be treated precisely like the ulcer, *viz.*, cauterization, and the indicated remedy.

PRIMARY SYPHILIS.

In the whole catalogue of diseases there are none that entail more serious consequences than syphilis. In most instances morbid action, even of the most formidable character, is confined to the individual; in the case of syphilis, however, there is a promise that the consequences will appear in the offspring, and for uncertain generations. Unlike most of the venereal contagions, the existence of syphilis is not dependant upon sexual commerce, so that the primary disease may be contracted, and numbers of other innocent persons infected, with transmission to their descendants, without imputation on the chastity of the original donor. A case in point is given by VAN HARLINGEN (*Inter. Encyc. of Surg.*, II., 451) as follows: "A young girl returning from a ball, kissed on parting the young man who had accompanied her home. She had been suffering from a cracked lower lip, and was consequently not alarmed when a 'fever blister' appeared in the locality a few weeks later. As this did not heal she sought relief after a time at a dispensary, where burnt alum or borax was applied for several weeks longer, the sore grow-

ing larger and harder all the time, and 'kernels' appearing under the chin. When I saw her, at this time, the girl had a well-marked chancre on the lower lip, with hazel-nut sized induration, and accompanied by enlarged submaxillary glands. On enquiring as to the health of the family I learned that an infant sister, of whom my patient was very fond, had for some little time past showed 'fever blisters' on the commissure of the lips, and on visiting the house I found the child suffering with a small chancre of the commissure, together with a general maculo-papular eruption. I at once quarantined the victims of the disease, but too late, as the mother and two more children subsequently showed generalized syphilitic eruptions, and the family remained under my care and observation for several years, showing various early and late lesions from time to time."

Syphilis may be described, as a contagious, specific disease, originating in sexual commerce, for the most part, and contaminating the whole organism. The initial lesion is always the characteristic sore, the *chancre*, no matter what the source of the contagion may be, whether from a primary, or later product of the disease, appearing at the point of contact. The so-called chancre, is not syphilis, it is only the initial symptom; syphilis is manifested by later phenomena. The blood of a syphilitic, and most if not all of the excretions are capable of communicating the disease to an unprotected individual, but in every instance the first symptom is the characteristic chancre appearing at the point of contact. The literature of this subject is so vast, proportionate to its importance, that it is almost impossible to arrange the mass of material in a condensed form and retain enough to make it of much practical value. The fact that every organ in the body becomes affected, in a certain order, each with pathological features peculiar to itself; that the offspring of syphilitics show forms of the disease unknown in their progenitors; that constitutional peculiarities, or dyscrasias modify the manifestations in a variety of ways; that climate, social habits, and occupation, as well as social condition all have a potent in-

fluence in determining the vigor of the morbid action, to say nothing of the influence injudicious treatment may have, combine to render the subject one that cannot be adequately treated in a single essay. The student must go to special and systematic works for full information, and then will find much of uncertainty and incompleteness in certain directions. From the fact that syphilis has probably existed from the first appearance of man on the earth, and must consequently be widely diffused throughout the human race, it is thought by some excellent observers that it must enter into the etiology of most if not all of the chronic diseases. As *surgical* pathologists, however, our enquiry is confined to the earlier manifestations of the disease, with a very general consideration of some of the later forms. It will be noted at this time, in passing (the matter requiring further consideration later), that the pathological character of syphilis is, to a certain point of development, constructive, new tissue being laid down, undergoing a certain organization, and then breaking down. From the fact, also, that the chancroidal disease is one of purely local consequence, the syphilitic being general, and in each case the invasion announced by the appearance of certain local lesions, it becomes a matter of the first prognostic, as well as therapeutic importance, that the character of this lesion be at once recognized. I shall accordingly essay reasonable minuteness in the description of the chancre.

The contagious principle of syphilis, is contained in the pus-cell, the corpuscular element in any infectious substance. Careful experiments made by PUCH and others seem to establish the fact that the serum is innocuous, the cell being the vehicle. The same peculiarity has been observed in the blood. It seems to be a question of quality altogether, the quantity of contagious material being a matter of indifference, the same results, both in kind and degree, following inoculation with either large or small amounts. Next to exposure to contagion, the first essential is that the virus shall be brought into contact with a surface capable of absorption. Not having any of the irritating properties of the chancroid pus, it may

remain in contact with an unbroken surface for a long time before it will be taken up. So necessary is capability of absorption to contagion, that there are many cases of undoubted authenticity, in which a woman has had intercourse with a syphilitic, and some hours afterward with a non-syphilitic, communicating the virus from the first to the second, and escaping infection herself. While inoculation is oftener effected through sexual commerce, yet the infectiousness of the blood, at least some of the excretions, and the products of late forms of the disease, afford numerous illustrations of communication through many different channels—children become infected by nursing from syphilitics; lovers from kissing; members of the same family or social circle from common use of articles of the toilet, or table furniture and utensils; exchange of clothing, contact with privy-seats or urinals, and numberless other channels of mediate contagion furnish many examples. In all of them, regardless of the source, mediate or immediate, or the stage of the disease, primary, secondary, or tertiary, the result is the same, *viz.*, the syphilitic chancre at the point of contact. There is much uncertainty as to the length of time that must elapse before the virus, outside of the body, loses its virulency. A case is mentioned by VAN HARLINGER (*l. c.*, p. 452), in which an old man of seventy years of age, who had not had sexual intercourse for many years, had a chancre on the glans penis, from friction on a pair of pantaloons that he had worn for some two months, formerly worn by a syphilitic. However communicated, mediately or immediately, after absorption a certain length of time elapses before any further developments occur.

This period of incubation is always prolonged, ordinarily ranging from fourteen to thirty-five days, rarely less than two weeks, although sometimes a much longer period than the limit is observed.

Syphilis seems to be a purely human disease, there being no well authenticated instances of anything like it in the lower animals. Experiments have been made, and are still making, but up to the present time the results have been negative.

The initial lesion, the *chancre*, of syphilis, appears in a variety of forms, for the most part quite inconspicuous, particularly in women; it may be, in fact, so small and unobtrusive that its existence may never be suspected. It is absolutely essential that it should be produced; every case of syphilis must have had a chancre, and, *per contra*, every chancre is the beginning of syphilis. Sometimes it appears as a small abrasion or bloody spot; at others a dry papule, which drops off, after a time, and shows the raw surface; again it is a fissure or crack, or assumes the pathognomonic ulcer form from the first. In the majority of cases the initial spot passes into the characteristic ulcer-form, but occasionally it does not. Whether ulcer or not, there is one constant feature, *viz*, the induration, which will be returned to later. The ulcer is small, with regular sharply-cut outline, hard base and edges, sides sloping inwards like the mouth of a funnel, the base is smooth and shining, the areola is dark, almost black, or coppery; the pain is insignificant, or entirely wanting, and the discharge very small. The ulcers are usually single, if *multiple they are of the same age*, appearing simultaneously, at different points of inoculation. The discharge is hetero-inoculable, that is innocuous to the individual, or others who have had syphilis. Upon microscopical examination the elements are found to be formative, not tissue-detritus as occurs in chancroid. The development of the chancre is slow, but it often disappears very rapidly, sometimes spontaneously in four or five days—forming a very faint scar which soon passes away, leaving no trace behind it. Occasionally acute inflammation may occur in the chancre, converting it into a rapidly destructive ulcer, particularly in the case of those of a broken-down or debilitated constitution. Such an unfortunate occurrence seems to be more common in China, parts of South America, and Africa than elsewhere, for reasons that are not yet understood. The destruction of tissue under these circumstances may be very great, more than in the worst cases of chancroid, but it is not stated that the later developments of the disease are notably modified thereby. The distinguishing features of this primary

stage, therefore, are the appearance of a small, painless, dry ulcer, single, and hetero-inoculable, with a peculiar induration.

The Induration of the syphilitic sore is a very different thing, from every point of view, than that which sometimes accompanies chancroid. In the first place it oftens precedes the chancre, and usually outlasts it. It is of the same extent as the ulcer, that is does not extend beyond the margins of the ulcer. The induration is met with in two or three different forms; sometimes it is a thin parchment-like layer; at others solid, more or less spherical, but in whatever form it occurs it is non-inflammatory, sharply defined, feeling like a foreign body under the mucous membrane, and if not precedent to the ulcer, at least is contemporaneous. The chancroidal induration it will be remembered, commences after the chancroid is established, thus constituting a distinguishing feature of syphilis, *viz.*, a laying down of new tissue primarily, with secondary destruction of the tissues displaced. Thus we find, that the initial lesion commences in the deposit of a fibrinous exudate, that undergoes a perfect organization; the nutrition of overlying parts is destroyed, a granular disintegration occurs, without a suggestion of inflammatory action, constituting the chancre. Active inflammation may be set up, accidentally, and the induration destroyed; if this should occur early in the case, it is possible that the disease may be aborted, as there is good reason for believing that the induration is the actual *materies morbi*; but it is far from being a general fact, as dispersion and lymphatic infection are simultaneous with the commencement of induration.

Bubo in syphilis is notably different from that of chancroid, resembling rather the glandular enlargements of carcinoma. The buboes are generally multiple, like a string of beads, hard, painless, non-inflammatory, indolent and chronic. Occasionally they soften, undergo an imperfect suppuration, the contents are discharged as an albuminous, gluey, viscid substance, and the further development of the disease ceases; it seems that the morbid material is thus eliminated from the body. The glandular enlargements, rarely commence until

the time the chancre is about to disappear, occasionally not until it has entirely healed, and in a few instances fail to develop at all. The failure of any glandular enlargement, may possibly argue the disappearance of syphilis, but the fact is not yet satisfactorily established. At all events the buboes are characteristic and diagnostic, their existence, in typical form, proving the specificity of a suspicious lesion. Should they inflame and suppurate spontaneously, the probabilities would be that the initial sore was a "mixed" one, particularly if found to be both auto- and hetero-inoculable. From a purely syphilitic bubo, the pus (or its equivalent), will always be hetero-inoculable. The location of the bubo will settle the question, very often, as to the location of the primary sore, as in cases where the manner of contagion, mediate or immediate, is in dispute, as affecting the chastity of individuals. When in the groins, the lesion has surely been in the genital tract, but may possibly, even then, not be of venereal origin. When the sore has been elsewhere, the glands interior to it will be those affected.

The chancre, and any ulcer resulting from the bubo, it will be noted, heals rapidly, as a rule, and leaves a very inconspicuous scar, unless it should, from any cause, become inflamed. The induration, however, under the scar, will disappear very slowly. Such is the semeiology of the primary stage of syphilis, and before passing to the pathology, it will serve a useful purpose to compare it with that of chancroid.

SYPHILIS.	CHANCROID.
<i>Incubation</i> , 14 to 40 days.	None.
<i>Tissues</i> , all kinds affected.	The same.
<i>Race</i> , confined to the Human.	Analogues, at least, in lower animals.
<i>Lesion</i> , erosion, papule, or ulcer	Pustule.
<i>Areola</i> , dark, or coppery.	Inflamed.
<i>Ulcer</i> , sloping sides; sharp edges; flat floor, smooth and shining; small.	Undermined sides, or steep; ragged edges; rough, worm-eaten floor; lustreless, large.
<i>Pain</i> , little or none	Comparatively great. Comparatively profuse.
<i>Discharge</i> , scanty, and hetero-inoculable; formative elements.	Auto-inoculable; tissue debris.

<i>Induration</i> , specific and circumscribed.	Inflammatory.
<i>Number</i> , single or of same age.	Multiple, successive.
<i>Process</i> , organization	Destructive.
<i>Development</i> , slow.	Rapid.
<i>Repair</i> , rapid.	Slow.
<i>Cicatrix</i> , small, inconspicuous.	Prominent, lasting.
<i>Bubo</i> , multiple, indolent.	Single, inflammatory.
<i>Hereditary</i> , as a consequence.	Acquired, no heredity.
<i>Prophylaxis</i> , immunity from later exposure as a rule.	No immunity.
<i>Secondary symptoms</i> , almost sure.	Rare or never.
<i>Local treatment</i> , no influence.	Curative.

The characteristics of these two affections, it is evident, have little or nothing in common. It is true that grafting chancroid on chancre, or producing induration by caustics, or secondary symptoms by mercury or other drugs may confuse the semeiology to an extent to forbid a positive diagnosis; but in uncomplicated typical cases, it is evident that such a widely different semeiology must, in the nature of things, argue a difference in the morbid action.

Pathology:—The essential nature of the syphilitic virus is not understood. There are many who think, with LUSTGARTEN, that there is a specific bacillus, but the fact is far from being proven; even if there is, in the future, confirmation of this theory, it will throw little light on the actual etiology, as I am firmly convinced that the bacillus will be found to be a consequence, as is quite generally the case throughout the domain of pathology. Certain physical facts are known, and many conflicting theories are deduced therefrom. We know that the morbid principle is resident in the cell, which has all the characters of a leucocyte, save size; it is found of the $1.00 \frac{1}{1000}$ inch in diameter, the normal leucocyte being $25 \frac{1}{100}$, and LYDSTON (*Syphilis*, p. 25) assumes that it is a free nucleus. This, however, if the fact should be proven, would be a histological anomaly, as the syphilitic corpuscle has an exaggerated, amœboid vitality, a property not attaching to free nuclei. In all other pathological processes, free nuclei argue degenerative conditions rather than formative, and there seems no sufficient reason for a departure from the usual course in the

present instance. It seems to be a fact, nevertheless, the syphilitic corpuscle is a very small, degraded lymphoid body, and that it communicates specific characters to other normal cells with which it comes in contact. Finding entrance into the organism, it excites an accumulation of leucocytes at the point of lodgment, without inflammatory phenomena—which undergo a solid and firm organization. This induces destruction of the overlying tissues, resulting in chancre, which is followed, or accompanied, by softening of some parts of the deeper portions of the new matter, detachment of elements, which are taken up by the absorbents, and as they enter the glands convert their products into syphilitic germs, excite a rapid production of new cells, of the same properties, inducing tumefaction of the gland (bubo). From this secondary base an increased number of infecting cells pass out, repeating the process in the next gland, attacking it with greater energy than the last, on account of multiplication of the elements, so that the gland becomes larger than the preceding one, and so on, from gland to gland, until the increasing size is lost to view by the chain extending into the deeper parts, and the infectious stream enters the general lymphatic current. The glands do not suppurate, because they are not inflamed; they are engaged in an exaggerated *production*, it is true, but the organization of the product is more perfect than in inflammation. Finally the blood is reached, and general syphilis is established. The blood now exhibits notable changes, which VAN HARLINGEN (*l. c.*, 476), describes as follows: “That the blood must undergo some change during the evolution of the syphilitic poison in the economy, has long been admitted, but the first scientific observations on the subject were made by GROSSI, under the direction of RICORD. GROSSI undertook a number of chemical analyses of the blood in persons suffering from venereal sores, and found that when these sores were not followed by subsequent syphilitic manifestations (chancre) the blood remained normal; while in cases where subsequent generalized symptoms resulted (chancre), the blood showed diminution of the globular mass with proportional in-

crease of the albuminous constituents. GROSS's results were confirmed by WILBOUCHEWITCH, of Moscow, who, desiring to study the influence of mercury on the composition of the blood, commenced by enquiring into its condition before the administration of the drug, and during the existence of chancre.

“In ten cases studied by WILBOUCHEWITCH, the average diminution of red corpuscles was 638,870 (the normal figure being taken as from 4,200,000 to 6,477,000), while the increase in the white corpuscles was 550, the proportion being one white corpuscle to 448 red corpuscles, instead of 1 white to 530 red the average normal proportion.

“Of course this impoverished condition of the blood would be likely to lead to various characteristic symptoms, and thus we find in some cases disorders of circulation, irregularity in the action of the heart, murmurs in the larger vessels, pallor, epistaxis, and occasionally œdema of the lower extremities. In addition, general malaise, loss of energy, and a constant sense of fatigue; nervous symptoms, such as vertigo, insomnia, and headache, particularly of a temporo-frontal character; also, vague and confused pains of various sorts—sometimes in the muscles, giving rise to simulated torticollis, pleurodynia, or lumbago—at other times concentrated in the joints or in the shafts of the long bones; in a word, any or all of the symptoms of an anæmic condition.

“While these symptoms of anæmia are not well marked in every case of early syphilis, yet one or another is almost always present in cases of average severity.”

I have now given the established facts of the pathology of primary syphilis, which briefly summarized show, in common with *all* forms of morbid action, a local commencement, whence the general disease is propagated; to suppose any other order of development, would be contrary to common sense, as well as resting upon no foundation of established fact. The initial lesion once produced, later phenomena are certain in the natural history of the disease, *unless the infecting and infected cellular elements are thrown out completely through one of the glands*. There must be a *complete* elimination, for a single

cell ($\frac{1}{100,000}$ of an inch) remaining will set up specific action just as surely as a thousand. The organism becoming contaminated, later forms of the disease are to be studied, but before doing so, something must be said of treatment.

Treatment.—Considering the manner of contagion, and the nature of the morbid material, not originating in the body but conveyed to it from without; that there is no known condition of the body which will resist contagion other than previous inoculation; that contagion, is in a sense material, and the morbid action develops from it as a centre of organization, it must be manifest to everyone, not blinded by prejudice, that treatment, in the ordinary meaning of the word, is and must be ineffectual. Remedies cannot change the state of a body so that it can resist such a powerful influence; they cannot destroy the infecting property of immigrant degraded cells. All that they can do, by any possibility, is to prepare the organism for the subsequent developments. It would seem, on cursory examination, that such an influence, purely local in its beginning, might be destroyed by direct treatment. Several causes combine to render such a thing if not impossible, at least improbable. First, there is no evidence of infection until the sore or the induration appears; then the poison has found entrance and lodgment, and dispersion with systemic infection has commenced. It is true scrupulous cleansing of surfaces that have been brought in contact with the syphilitic matter, might, probably *would* remove all danger. Unfortunately, however, either the suspicion of such contact does not exist, or else the alarm occasioned thereby may prompt to too vigorous an ablution, occasioning abrasion that furnishes favorable conditions for the admission of even one of these minute cells. In the second place, the first symptom being the sign of dispersion of the elements, caustics will only hasten and facilitate the process, and also expose the patient to danger of inflammation, which would probably add immensely to the gravity of the case. Excision is open to the objection of being indefinite, as no one can tell how far from the point of entrance the infection may have gone. In fact

the universal verdict is, in all schools of practice, that local treatment is not only inefficacious, as to prevention of the disease, but even harmful to the patient. Unhappily the same verdict, to some extent, is universal as to so-called "constitutional treatment." With or without treatment, of any kind, the ulcer heals, and the buboes disappear in about the same length of time, and under all circumstances secondary symptoms appear. Indeed the speedy disappearance of the local lesions, seems to be a promise that the secondary manifestations will come on earlier, and be more severe, than if more time was taken. A bubo *may* soften, and the contents be discharged, but it must be done spontaneously, by the *vis medicatrix naturæ*: if it is attempted artificially, the syphilitic leucocytes are stimulated to unwonted activity, and dispersion goes on with increased rapidity. Hence I say, and I think all *experienced* practitioners will yield assent - primary syphilis is incurable, in the very nature of things. Some will ask: Do you let such cases go without treatment, therefore? I answer no! and for sufficient reason. It is true that treatment makes no impression on the initial lesion, and that secondary symptoms are as certain to come as night is to follow day; no man ever saw a case of secondary syphilis that did not follow a primary chancre; and no man has seen a true chancre, unquestionably syphilitic, that was not followed by secondary disease. These are facts. But it is within the experience of all men, that those who have judicious treatment in the primary, develop a milder secondary disease, and one that is more amenable to treatment than those which have not had such treatment. There are cases, I am aware, reported on fairly good authority, in which no later symptoms have followed primary lesion; but it is safe to say that such lesion could not have been syphilitic, or else there was spontaneous softening, and suppuration of the bubo. Nothing can be prognosticated on the primary lesion; an insignificant erosion, with the least possible induration, and a barely noticable glandular swelling, may be succeeded by exceedingly virulent secondary and tertiary symptoms. The converse is also true.

as well as that the same remark applies in each stage; that is, a mild secondary disease, may be followed by a malignant tertiary, and also the converse. Furthermore, while the appearance of secondary disease within six months after the primary, is generally confirmatory evidence of the syphilitic character of an initial lesion, yet the failure of such development is not always to be esteemed proof to the contrary. There are cases in which such development has been delayed many months, and a few in which they never appeared, and yet children of the suspect had proof of the specific character of the parent's perhaps forgotten disease. Without multiplying instances and illustrations, sufficient has been said to make good the statement, that the primary disease may be considered essentially incurable, and to suggest to those entertaining different views that the poverty of such testimony as they must necessarily rely upon, stands in the way of any positive assertions based upon a few cases, and these, probably, lost sight of soon after the supposed "cure" was effected. The *only* evidence that a cure has been secured must be furnished by the children and grand-children of the original syphilitic.

The principles of treatment of primary syphilitics, are largely expectant, in an uncomplicated case. *Mercury* is undoubtedly the simillimum, the *corrosivus*, at least in my practice, being the best form; I use it in the 30th attenuation, about four times a day. Such treatment will rarely satisfy the average patient, so that if he is not of a class to appreciate the problems involved, it will be necessary to use something that *looks* at least like direct treatment, vaseline, cosmoline, calendula jelly, or the like, may be used for purely moral purposes. The point of first importance, to remember in all cases, is that the utmost care must be taken to avoid any manipulations that would have the effect to excite inflammation. Should suppuration of the buboes threaten, every means should be taken to promote it, and on the first indications of softening, they should be freely opened.

Another item of equal importance, but for different reasons—is to guard against infection of third parties. The same

precautions are to be employed as in chancroid, with even greater care, inasmuch as the inoculation of another person would entail such disastrous consequences.

CONSTITUTIONAL SYPHILIS.

Within a month after the subsidence of the primary symptoms, sometimes not until a year after—(and in some instances before the healing of the chancre) signs of general infection come on, affecting first the skin and mucous surfaces, and gradually extending to deeper structures, until the whole organism becomes infected to a degree that may destroy life. There is much diversity in the classification of these later manifestations: the most generally used is to call *secondary* all manifestations confined to the skin and mucous tissues; *tertiary*, those of the deeper soft parts, viscera, and bones; and *congenital* when the offspring are born with extensive lesions, not primary in character. When the infant has become inoculated from a mother with primary or secondary disease, it is often called *infantile*, as distinguished from the *congenital*. In this case the disease commences with the chancre, and runs through the typical course; in congenital, it already has late lesions, from the mother having progressed to constitutional symptoms. Should the mother be generally syphilized at the time of conception (when conception is very rare) premature delivery is the rule. In the *Medical Record* (March 24th, 1888, p. 330), is an editorial notice of a doctrine that seems to be well established. It says: "Syphilographers are now very generally agreed that a syphilitic woman may beget a syphilitic child without infecting her husband, and some believe that a man who is a sufferer from the disease in its later stages may beget a syphilitic child while the mother escapes infection."

"Although there is little doubt concerning the first of these points, there is, nevertheless, much dispute as to the time at which the child becomes infected. It was formerly held that a woman who did not acquire the disease before the seventh month of gestation would give birth to a healthy child.

CHABALIER has reported a case in which a woman became infected sixty-three days before the birth of a syphilitic child. But an instance is now related by Dr. F. SORRENTINO, in *La Riforma Medica* of December 23, 1887, in which the date of infection was but fifty-two days before delivery.

"A woman, twenty-six years of age, of sound general health, had been married at the age of twenty to a coffee-house keeper, by whom she had had two healthy children born at term. In May, 1886, her husband left her, when she was two months pregnant, and went to Marseilles on business. He returned home on November 14th, and had intercourse with his wife at that time, infecting her with a syphilis which he had contracted during his absence. Fifteen days after the primary sore was noticed an extensive roseola appeared, which was treated energetically by subcutaneous injections of mercuric chloride. The child was born on January 5th, fifty-two days after the mother's infection. It seemed at first to be healthy, but soon manifested the symptoms of hereditary syphilis. There was no sore about the lips, mouth, or pharynx to suggest the possibility of infection from the mother post-partum.

"This case, if all sources of error can be excluded, would appear to demonstrate conclusively that a woman may give birth to a syphilitic child when her disease is contracted later than the seventh month of gestation."

With this question, however, as well, indeed, as the whole of constitutional syphilis, the surgical pathologist has only a secondary interest; the dermatologist, ophthalmologist, pædologist, and others, having to do with the different forms more directly. In cases of doubt and obscurity, such as very many are, the history of the case, as developing the existence of the primary disease, is all essential; without absolute proof of such an occurrence, there are many forms of constitutional disease that could not be detected, at least until valuable time had been lost.

HAMILTON (*Prin. and Pract. of Surgery*, third ed., p. 146) quotes the following table from MARTIN, which will be

found an exceedingly valuable guide in determining the syphilitic character of a doubtful lesion. The first column gives the date of usual appearance; the second the earliest noted, and the third the latest:

SYMPTOMS.	USUAL APP'CE.	EARLIEST	LATEST.
1. Roseola (Erythema) - - -	45th day.	25th day.	12 mos.
2. Papular eruptions (Lichen) - -	65th day.	28th day.	12 mos.
3. Mucous patches - - -	70th day.	30th day.	18 mos.
4. Sec. affec. of fauces - - -	76th day.	50th day.	18 mos.
5. Vesicular eruptions - - -	90th day.	55th day.	6 mos.
6. Pustular eruptions - - -	80th day.	45th day.	4 years.
7. Rupia - - - - -	2 years.	7th mo.	4 years.
8. Iritis - - - - -	6 mos.	60th day.	13 mos.
9. Sarcocoele - - - - -	12 mos.	6 mo.	34 mos.
10. Periostitis - - - - -	6 mos.	4 mo.	2 years.
11. Tubercular eruptions - - -	3 to 5 yrs.	3 years.	20 years.
12. Serpiginous - - - - -	3 to 5 yrs.	3 years.	20 years.
13. Gummy tumors - - - - -	4 to 6 yrs.	4 years.	15 years.
14. Onychia - - - - -	4 to 6 yrs.	3 years.	22 years.
15. Exostosis - - - - -	4 to 6 yrs.	2 years.	20 years.
16. Ostitis and bone lesions - -	3 to 4 yrs.	2 years.	41 years.
17. Perforation of palate - - -	3 to 4 yrs.	2 years.	20 years.

The above gives the order of sequence of the various symptoms of constitutional syphilis, as usually observed, but there is some variation occasionally. The earlier manifestations are occasionally absent, at least may be of such an insignificant character, objectively and subjectively, that they have never attracted attention. In part this is occasionally true of the secondary group, from 1 to 10, entirely; particularly do we find Rupia often absent, also Sarcocoele. The fact that the secondary phenomena are of a mild type, gives no promise of equal benignity in the tertiary group (10 to 17). The natural history of the disease, uninfluenced by treatment, gives most extensive tissue changes in the tertiary stage, the unfortunate sufferer becoming an object of disgust to himself and others.

I do not deem it within the scope of this work to enter more at length into these later forms of the disease, our province as *surgical* pathologists terminating with the close of

the primary stage. This is particularly true, as far as literature is concerned, as the determination of specific characters in a given case, can be secured only by comparison with non-specific forms of the same or similar affections, and then, after all, to be confirmed by the earliest history. The student would naturally look to special treatises for such comparison and description, and to them reference is now made.

Treatment. If the primary stage of syphilis is incurable, certainly the secondary, and probably the tertiary are quite different; it is doubtful, however, if as much can be said for the congenital form, as the very fountains of life are then poisoned. In most of the symptoms, in either stage of constitutional syphilis, *Mercury* will find a place in the therapeutics. Next in value, particularly in mercurialized cases—the *Kali iod.* must always claim attention. I have faithfully tried this remedy, in all attenuations, from the first to the highest of the FINCKE “potencies,” and uniformly failed in securing any curative results, or in fact results of *any* kind. In the crude form, in doses of five grains, many of the worst cases have been apparently cured promptly. One case of perforation of the palate, with the greatest destruction of tissue I had ever seen, was cured in a surprisingly short space of time. I think, however, that the so-called tertiary symptoms are those in which this drug will be found to exert its best influence. But our therapeutics are not to be confined to these two remedies. *Asaf.*, *Aur.*, *Nit ac.*, *Arg. nit.*, *Sarsap.*, *Thuja.*, and many others are to be used on purely Homœopathic indications, precisely as though the case were one of the non-specific character. In the pure, uncomplicated cases, however, the indications *will* point to Mercury, and if this drug has already been used to excess, so that the patient is “mercurialized,” then, the iodide of potash seems to stand as a specific remedy, on chemical, symptomatic, and experimental grounds. There can be no charge of “routinism,” eclecticism, or “mongrelism” sustained here, as the disease is eminently specific, and, according to JAHR and the older homœopaths, must have a specific remedy.

XVII.—LITHIASIS

FLUIDS in the body, that hold inorganic matter in solution or suspension, often undergo decomposition, throwing down the solids, which become calculi, lithic or calcareous. Such bodies are often found in the salivary glands, particularly, or in the lymphatics generally. The process may be pathological or accidental, but in either case is due to an excess of solids, a super-saturation, either relative or actual. If a solution is retained in a cavity, the watery portions may be absorbed, and the material held in solution thereby thrown down. This may be purely accidental; or there may be some fault in excretion, by which there is an excess of solids, or a diminution in water, in either case the solids being in excess, relative or actual.

While *lithiasis* means the disposition to the formation of concretions, in any parts of the body, calcareous or lithic, by common consent the use of the term is restricted to the formation of calculi in the urinary tract. It is in this sense that the term will be used in the present article. Roughly stated the appearance of gravel in the urine represents an excess of the constituent forming the stone, either relative or positive, and thus stands as the expression of some disturbance of nutrition. As a matter of fact the varied diet of nearly every one in civilized life forbids anything like constancy in the chemical character of the urine, the composition varying from day to day, and hour to hour; it is possible, therefore, to have an excess of urinary elements, at times, with no pathological state back of it. The persistence of a urinary abnormality is, on the other hand, always to be taken as an evidence of disease. There are certain forms of urinary calculi that are

produced by changes in the urine after it has left the kidneys, changes produced in the bladder from purely chemical causes, and that have no significance of a pathological character. It is therefore of the first importance that the origin of a calculus, or its nucleus, should be accurately determined, for purposes of diagnosis, prognosis, and therapeutics; a state of the urine in the bladder, very often, would be as far removed from the action of remedies, as though it were in a vessel outside of the body. For instance, a stone originating in the bladder is nearly always due to the presence of a nucleus of foreign material, the urine being normal in composition, and the urinary function physiologically carried on. There is nothing for medicine to do, in such a case, as no change in the urine is desirable, the existence of the stone, under these circumstance, being evidence of the normal character of the urine. The sole indication is to remove the foreign body. Indeed this is the first indication in all cases of vesical stone, but the significance attaching to origin does not stop here. If the stone is of *renal origin*, its removal from the bladder will not cure the patient, as recurrence must ensue; the urinary function must be ordered. If the calculus originates in the *bladder*, its removal may be considered a cure of the patient. Thus we find it necessary to study *urinary* stone, under various headings, such as: *Renal, Urethral, Vesical, Prostatic*, and *Ureteral*-lithiasis. Before taking up these topics, a word must be said of the composition of the urine, its physiological importance, and the conditions under which its constituent proportions are altered. Taking the mean of a large number of examples, the normal composition of urine may be thus stated (DALTON, *Phys.*, p. 327, 7th ed.):

	Water	-	-	-	-	-	950.00
Nitrogenous Organic Substances.	{	Urea	-	-	-	-	26.20
		Creatinine	-	-	-	-	0.87
		Sodium and potassium urates	-				1.45
		Sodium and potassium hippurates					0.70

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Mineral Salts.	{	Sodium biphosphate	-	-	3.35
		Lime and magnesium phosphates			0.83
		Sodium and potassium chlorides			12.55
		Sodium and potassium sulphates			3.30
		Mucus and coloring matter.	-		0.35
					<hr/>
					1000.00

This gives, in round numbers, about fifty parts in a thousand solids, but, it will be remembered, the solids are not present *as such*, being in solution. The appearance of free solids must always be taken as evidence of abnormality, when occurring in freshly voided urine; urine that is retained in the bladder may undergo decomposition, precisely as though allowed to stand in a vessel outside of the body; the precipitation of the solids, to constitute a pathological state, must occur in the kidney, or deeper parts of the urinary tract. When the acidity of the urine is normal, there will be no precipitation of solids, because all the acids are taken up by the bases; when the acids are in excess, that portion which cannot be taken up by the bases is free as a precipitate; when the alkaline bases are in excess, that portion of them which does not take up the acids, remains free, and an alkaline precipitate occurs. It is thus apparent that there may be an actual excess of the constituent appearing in the precipitate, or a relative deficiency of the element with which it should combine. Anything which would temporarily increase or diminish the acidity of the urine, as articles of food or drink, unusual exertion or fatigue whereby waste is exaggerated and urea increased, would have the effect to produce a precipitation of solids, but would not necessarily have a pathological significance, unless frequently repeated, or it became habitual. Such are the main facts, of interest at this time, of the composition of the urine, and its normal variations, and yet, as a matter of diagnosis, it should be remarked, that the microscope and urinalysis may show all the conditions of lithiasis, and yet there may be no calculous formation; and, on the other hand, there may be stone, and no symptoms either sub-

jective or objective. As a matter of fact, however, when the conditions of lithiasis are observed, the disease is existent, it not being essential that the calculi should remain within the body; the retention of the stone may be regarded as an accidental occurrence, *the formation being the diagnostic feature*.

From what has just been written it is evident that habits of life, diet, drink, and possibly climate must have much to do with the lithic diathesis, and yet, as to races particularly, the data are very inconclusive. In fact nothing can be predicated, as to liability to lithiasis, on race, climate, or geologic conditions. It appears that the Rhenish provinces in Europe, and the New England states in America, are singularly free from calculous disease, attributable, as some conclude, to the free use of light wine in the one, and cider in the other. *Age* seems to be an important factor, more cases occurring in young people, and the aged, than those of middle life. *Sex* has an important influence, largely for anatomical reasons, at least as far as retention of stone goes. Probably lithiasis occurs with equal frequency in both sexes, but owing to the capacity, shortness, and comparatively simple construction of the female urethra retention is far less common among women than men.

The facts briefly stated above, must be taken as a simple introduction to our present subject, and yet few as they are, and apparently essential, there are many exceptions. To fully treat of the formation of urinary stone, would require such an extensive review of physiology and organic (or physiological) chemistry, that the limits of this work would be far too narrow. While the excess of any acid, alkaline base, or urinary salt must stand as the actual and proximate cause for the appearance of a calculus, it must be remembered that excess may be not only merely relative, but constructive, to coin a word. Thus at the normal temperature of the body, urinary solids will not be precipitated unless a nucleus is furnished; with lowered temperature precipitation will occur even without a nucleus. Thus the accidental introduction of a foreign body into the urinary tract, with the urine absolutely normal in all particulars, will result in a throwing down and

crystallization of urinary salts at any time. Impediments to the evacuation of urine, either by obstructions in any part of the passages, or paralysis of the bladder, will cause a necessary accumulation, with consequent decomposition, and precipitation of solids. The fact will be stated again, but needs mention here, that the *kind* of precipitate—acid or alkaline—will depend largely on the characters of the nucleus; in the use of the word “foreign,” also, organic bodies, originating within the body, are as much foreign as though introduced from without. Thus it makes no difference, whether the nucleus is a drop of blood, pus, or mucus, or a piece of bone, musket shot, or the like. The curious fact to which attention is called, is that when the nucleus is soft, the resulting concretion is uric acid, or the calcic-oxalate; when the nucleus is hard, the concretions are phosphatic. It is noticeable, that in the large majority of calculi of uric acid, the nucleus is nearly always found to be a clot of blood, or drop of mucus.

Before taking up the study of the varieties in lithiasis, something must be said of the physical characters of the stone, as to shape, size, number, consistency, and the like, in other words the macroscopic features. First as to the material. While any one of the urinary salts, acids, or alkaline bases may form the body of a stone, there are some that are more common, either singly or combined. These are uric (or lithic) acid, calcic-oxalate, calcic-phosphate, and the triple (or ammoniaco-magnesian) phosphate.

Uric Acid is seen, under the microscope, in the form of crystals of various shapes, chiefly rhombic, or lozenge-shaped, with the angles rounded off. They are either colorless, or stained yellow by the coloring matter in the urine.

Oxalate of Lime, due, as will be seen later, to acid decomposition of urine, appears as minute, clear, transparent crystals, either octahedral or “dumb-bell” in form, when simple; when compound they assume a somewhat complex shape, on first view, and also when viewed from different positions. Thus crystals are seen that present an angle to the observer, and others that are compound from the union of two. Combina-

tions may, however, be to any numerical extent, so that the resulting shape may be very confusing.

Calcic-Phosphates may sometimes be amorphous; when crystallized they are of irregular form, as to outline, being ragged, and of a white color, tinged with yellow, in some instances. There are certain "dumb-bell" forms, however, but they are very different from the calcic-oxalate. These deposits usually appear as a result of alkaline decomposition.

Triple-Phosphates, or the ammoniaco-magnesian phosphates—likewise appear as a result of alkaline fermentation, the alkaline excess being ammonia. The form of the crystal depends upon the rapidity of the process, being stellar when rapid, and prismatic when slow.

While other substances are frequently found as elements of stone, the above constitute fully ninety per cent. of all urinary calculi. The stone may be composed of a single element, surrounding the nucleus, constituting the *simple* form; or there may be an arrangement of layers, or incrustations, sometimes each layer of a different element, forming what is known as a *compound* stone. The physical characters of calculi may be described as follows:

Numbers:—There may be a single stone in the bladder, or in any number from two to several hundred. When single the origin is usually vesical, but a final decision on this point must be determined by the nucleus, to be returned to later. When multiple, the origin is quite surely renal, and the condition is certainly pathological. Single stones are usually phosphatic, or phosphatic, with a uric or calcic-oxalate envelope. Multiple stones, are either uric acid or oxalate of lime. Occasionally, however, a stone becomes fractured, and two or more calculi may exist notwithstanding the origin is vesical. Number, therefore, cannot be held as conclusive evidence as to origin, unsupported by other facts.

Form:—There is great variety in the form of urinary stones, depending upon many circumstances. When single, they are irregular, from the direction of growth given to them by their surroundings, or the form of the nucleus, particularly

when one portion, the oldest, is encysted or held in any way, the accretion then being on the free part. When there is more than one stone, attrition of one on the other smooths down sharp angles and other irregularities, until they become more or less spherical—Single stones are quite frequently ovoid or spherical, when free in the bladder, from the constant change of position to which they are subjected. The density of the calculus has much to do with the shape. Solid heavy stones, such as the oxalates and lithic acid, from their manner of growth, are quite regularly ovoid, being laminated, or concentric. Soft phosphatic calculi are much more irregular in growth, and consequently of no constant form.

Size:—The size of calculi is very variable; when sufficiently large to be worthy of the name of stone, they are from the size of a grain of wheat, to a mass as large as a billiard ball. Multiple calculi are smaller as a rule, and thus small stones are more likely to be of renal origin than large ones. This presumption is increased from the fact that small, multiple stones are generally of uric acid.

Color:—Each variety of stone has its peculiar color. Sometimes, in cases where the bladder is exceptionally irritable, the outside of the stone will be stained by blood, or coloring matter from the urine, so that fracture will be necessary to determine this point. The phosphatic stones are white, or grayish-white like plaster; the uric acid yellow, or pale brown; the oxalates are dark-brown, even approaching black.

Consistency:—Stones of a firm close texture, hard, and not easily fractured, are either uric acid, or oxalate or lime, the latter being the hardest. The phosphatic stones are of loose texture, and friable; occasionally, particularly with the calcic phosphates, there is no organization of stone, the material being disposed in masses like fresh mortar, or sand.

Weight:—The heaviest stones are the oxalates, next the uric, the phosphates lightest. In some instances these calculi are so light that they float on the urine in the bladder.

Odor:—In most cases the stones are odorless, but frequently it is otherwise, the odor being peculiar to each variety.

Thus the phosphatic concretions have a fetid, or ammoniacal odor, as they are calcic or triple; the uric acid has a urinous, and the oxalate a seminal odor.

Nucleus:—When other distinctive characters are wanting, or negative, inspection of the nucleus will often give desired information. Thus if a clot of blood, drop of pus, or mass of vesical epithelium is found, the stone originated in the bladder; if a crystal of uric acid, oxalate of lime, or renal epithelium forms the nucleus, there *has* been a renal lithiasis. Of course a nucleus of foreign material, such as a gun-shot, piece of catheter, hair-pin, or the like, would definitely settle the question of renal or vesical origin.

There are cases in which something may be told as to the *kind* of lithiasis in advance of an inspection of the calculus, by an examination of the urine. It is true that urinalysis, as a rule, is quite inconclusive, as said earlier, as stones may exist in the bladder, and the urine give no indications, and the reverse. Then again a stone may be formed from renal lithiasis, and the renal disease subside. Nevertheless there are cases in which the disease does persist, and the urine will give the testimony.

It must not be forgotten, that when the urine is found loaded with the elements of stone, the lithic disease is present, whether distinct concretions exist or not. Also these elements may be found in the urine, coming from disintegration of a phosphatic stone, or a failure in cohesion.

The examination of urine, therefore, is not of value as determining the existence of stone in the bladder, but as settling the question of a lithic diathesis. The inspection of the urine, without chemical processes, is often of value. Thus when the urine is putrid, soon after passing, and has an oily-looking pellicle, the presumption is an excess of calcic or amorphous phosphates. When either putrid or ammoniacal (oftener the latter), and the pellicle is iridescent, triple phosphates are the rule. A sediment of red or yellow sand, the common "brick-dust" deposit, is usually uric acid; when a glassy, tenacious, and gritty deposit exists, the presumption is in favor of oxalate of lime.

The student has at his command certain simple tests that may be useful. Thus if a suspicious specimen clears up under heat, the deposits are urates. They can be reproduced by cooling the specimen, or adding a drop of acid. A suspicious gravelly deposit, may be roughly tested as follows: Potash or soda, will dissolve uric acid; nitric acid, will clear up the oxalate of lime deposit without effervescence. The phosphates are unchanged by heat, but are dissolved by acetic acid. BRYANT (*Surg.*, p. 573), puts it in this summarized form;

“*Heat*, dissolves only the urates of the urine.

“*Potash*, dissolves all deposits except the phosphates and oxalate of lime.

“*Hydrochloric Acid*, dissolves all except uric acid.”

Occasionally a more determinate test is required. Some of the more useful are as follows:

Uric Acid.—Expose the suspicious sediment to the fumes of ammonia, and if it be uric acid, a beautiful crimson color will appear, due to the formation of the purpurate of ammonia. This is known as the *murexide test*.

Calcic Oxalate.—In addition to the tests noted in another place, should there be any doubt as to the sediment, the failure of the murexide test would negatively determine the absence of uric acid, and thus presumptively determine the presence of calcic oxalate. *Uric Acid*, however, may be present as well as oxalate of lime, and therefore the only positive test is the microscope.

In some one or more of the processes noted the determination of the nature of urinary deposits may be made, and some information thus obtained of the source, a matter of the first therapeutic and prognostic importance. There are some who look with suspicion on all such statements, as tending to what they call “mongrelism” in therapeutics. A moment’s consideration, it would seem, should effectually dissipate such a fear. Calculi originating in the bladder, to repeat a former statement, may be due to a nucleus of foreign material, or the products of some vesical abnormality, such as inflammation, irritability, or tumors, or the decomposition of urine retained

by reason of stricture, acute or chronic, or the changes in the organ, due to old age. Such calculi are generally phosphatic, or if uric acid will furnish evidence as to source from inspection of the nucleus. When such evidences exist the indication as to *treatment* is plain; if the nucleus is extraneous, the removal of the stone is the beginning and end of therapeutics. Should the nucleus be a product of vesical abnormality, simple removal of the stone cannot be considered curative, while it is a very essential step in the process. So also with nuclei originating in the kidney. As to *prognosis*, the application is easy; inspection of the stone, and a study of the constant urinary characteristics will determine the question of liability to recurrence.

RENAL CALCULI.

Renal Calculi are urinary stones formed in the kidney, depending upon some morbid agency operative in the kidneys, or a general disorder of nutrition. Remembering that there may be a profound lithiasis without the formation of a stone, the urine being loaded with the elements, but further organization not occurring; and that such consequences may be purely temporary, from some indiscretion in diet and drink, it will only be necessary to recall an earlier observation, that increased acidity, or alkalinity is the proximate cause for the appearance of the calculi. There are cases in which the urine is always loaded with a sandy deposit, constituting what is known as "gravel," and it may be stated as a rule that the usual fate of a renal calculus is to pass out into the bladder, and so to the outer world, without giving rise to any subjective symptoms. In such cases, however, the masses are too small to be worthy of the name "stone," being, for the most part, simple or compound crystals, of microscopic size. Occasionally, however, larger masses will form, and either make their way to the bladder, giving intense suffering (the collective symptoms being known as *nephralgia*, *nephritic colic*, etc.), or are retained in the kidney, causing *hydro-* or *pyo-nephrosis*, with more or less complete destruction of the

organ, or even causing death. Before giving the semeiology of these different states, it will be necessary to glance at the conditions favoring the various forms of lithiasis.

Uric Acid lithiasis, the most common, is due to sub-oxidation, whether from defect in the process itself, or on account of the increased waste. Accordingly we find most cases among the overworked, mentally and physically—or those whose occupation is very sedentary and monotonous, particularly if they consume much nitrogenous food, or eat hastily and to excess, returning to their work again without sufficient repose. In short the typical American business man is at one end of the lithic diathesis, and the farmer next to him in order of predisposition. There is another class of cases, however, that more surely develop lithiasis, *viz.*, those with affections of the heart or lungs that induce venous stasis.

Calcic-Oxalate lithiasis is a result of the excessive use of starchy food, living in badly-ventilated houses or rooms, bodily inactivity, and the use of alcohol. Such persons become hypochondriacal, lose interest in their occupations, are drowsy during the day, and yet sleep poorly at night. If the urine is examined, the characteristic crystals will be found, and the affection is recognized as *oxaluria*, one which quite surely leads to nephritis in some destructive form. There are two circumstances that must be borne in mind, however, normal urine is frequently found with crystals of oxalate of lime after it has stood for twenty-four hours or longer, having undergone an acid fermentation; hence oxaluria can only be established by the examination of specimens less than a day old. Still there is room for doubt, the age of the patient, or states of the bladder being important factors. Any condition of the urinary passages that would produce retention of even a small amount of urine (such as stricture of the urethra, sinking of the floor of the bladder, sacculations of the ureters, or the like) would furnish favorable conditions for acid fermentation, and throwing down of oxalate of lime crystals.

Phosphatic lithiasis is largely due to osseous diseases, such as rickets, or to over-work in the mental sphere. The condi-

tions of the urine are very significant in this direction; in one case a diversion of bone-salts or elements is shown; in another an excess of earthy phosphates, and in still another exaggerated waste. The amorphous phosphates (calcic) are simply "thrown out of solution," the triple are the result of an excess of ammonia, and the crystallized calcic phosphates an excess of calcium. So, also when the crystallization of the triple phosphate is stellate, showing a rapid formation, it would indicate changes in the urine in the bladder. Such crystals, and the amorphous or earthy phosphates, are simply the result of alkaline decomposition in the bladder, and are of minor pathological importance to the prismatic triple, or crystallized calcic phosphates, which show a derangement farther back, and consequently more profound.

Nephralgia.—The natural history of *renal* (or *nephritic*) colic, and the semeiology, is something as follows: A crystal of some kind lodges in one of the tubules, perhaps in the renal pelvis, or even in the glomerulus, and soon serves as a nucleus for other crystals until a calculus of appreciable size is formed. It may remain for an indefinite time without producing any symptoms, but on some jar of the body, or an unusual accumulation of urine behind it, dislodgment occurs, and symptoms suddenly appear. I think the majority of cases occur in the morning, just before or after rising. Next in frequency such exciting causes as jumping from a carriage or street car. However dislodgment is effected, it is announced by a sudden and severe pain, not localized, "somewhere in the abdomen"—gradually increasing in intensity, extending from the pelvis, or the lumbar region, into the glans penis, and down the thigh. The pain increases to such a degree that the most courageous and phlegmatic men are completely unnerved, rolling on the floor, and contorting the body; the body is often bathed in a profuse perspiration, and more or less nausea is experienced from the first. There is urging to urinate, but the amount of urine is small, and the effort seems to increase the sufferings. Finally, varying from two to ten or even fifteen hours after the commencement, there is retch-

ing and vomiting with great nausea, and a sudden subsidence of the pain, with copious urination. The urine may be more or less bloody, and occasionally the stone, not larger than the head of a pin, will be expelled. The pain ceases, but there is much soreness and lameness for a day or so, and the exhaustion is considerable. The cause of this veritable agony is the passage of the rough calculus along the ureter, the mechanism of which is as follows: The first effect of the dislodgment of the calculus, and its entrance into the ureter, is a spasmodic contraction of the muscular fibres, and severe pain. Later the sensitive lining membrane becomes somewhat more tolerant, and the peristaltic action of the three layers of muscle gradually forces the intruder onwards to the bladder. The accumulation of urine interior to the stone, has the effect to somewhat dilate the passage, facilitating its movement, the irritation extending to the kidney determining an increased excretion. When the stone enters the last portion of the canal, where it passes for some distance between the coats of the bladder, the pain is increased, the continuity of tissue causing more distinct localization, and at the same time increasing the nausea. The nausea and vomiting now has the effect to induce muscular relaxation, the retching at the same time aiding the pressure of the urine behind the calculus, which drops into the bladder, followed by a rush of urine, and cessation of pain. This is the natural history of nephralgia; all cases do not terminate so happily.

Treatment:—The treatment presents a number of indications. *First*, the passage of the stone must be facilitated. *Second*, the lithiasis must be cured to prevent a recurrence. It seems to many that the condition being, as they say, a “purely mechanical” one, narcotics or anæsthesia must be used. A moment’s consideration, I think, will show this to be a great mistake, from all points of view, “mechanical” and scientific. The first and most important consideration in the case is, that the passage of the calculus shall be facilitated and assured; its lodgment in the ureter will be disastrous; a prolonged passage, from the amount of injury inflicted on the

tissues, may produce stricture of the ureter, a condition only secondary, in gravity, to lodgment. Certain passage *can only be secured* by the accumulation of the urine behind the calculus, and the peristaltic action of the ureter itself. Opiates suppress urinary excretion, and thus one of the most important factors is taken out; they also limit or destroy muscular irritability, and the remaining one is negatived. Neither process may be completely arrested, but is certainly diminished in force, and the passage of the stone is prolonged. If, therefore, moderate narcotism is induced the ureter is exposed to injury that may imperil the life or comfort of the patient; and if the narcotism is complete or profound, there is danger of arrest of the stone, and destruction of the kidney, or the life. The objections to narcotics do not end here: They diminish the water in the urine, relatively increasing the solids, and subsequent nephralgia is almost assured. Anæsthetics are only less hurtful, as the peristalsis is diminished while the urinary excretion *may* not be interrupted. Hence from any point of view, mechanical and otherwise, as to the present and future of the patient, the use of opiates or narcotics is manifestly unwise and dangerous. Fortunately we are not left weaponless in these emergencies.

China, in any attenuation, has never failed me in alleviating the sufferings, and shortening the duration of an attack. Its action can be explained on "*rational*" grounds, for those who delight in such things. It increases the urinary excretion, thus dilating the ureter, and consequently diminishing the pain and shortening the transit. It should be given frequently, once in fifteen minutes, and the patient encouraged to endure the suffering from a consideration of the dangers attending other procedures. We often find that persons who are treated on the so-called "*rational*" plan, are subject to frequent attacks, a history that does not attach to those treated as I have indicated. At the same time much benefit will be found in the use of hot applications, and promoting vomiting.

The calculus having passed into the bladder, it must be watched for in the passages of urine; and examined with a

view to determine its character, as the curative treatment of the lithiasis is entirely dependent upon the chemical form. Should the stone be lost, other means as already described, must be employed,

Uric Acid being the form, there are a number of remedies from which to make a selection. In the absence of any special indications *Arsenicum* occupies the first rank. *Lycopodium*, or *Chamomilla* may be needed where there are general indications, and in a few cases there have been symptoms calling for *Sarsaparilla*. The urinary symptoms are practically alike in all cases; the selection of the remedy must be made from a comparison of the general symptoms. It is possible to cure a lithic acid lithiasis with remedies alone, but the process will be greatly facilitated if attention is paid to the diet and habits of life, suggested by the conditions referred to in an earlier paragraph. Thus the food should be less nitrogenous, eaten with greater deliberation, and care taken to procure adequate recreation and amusement. "Chemical" treatment is useless, that is giving alkalies, so much in vogue in certain quarters. If the case is not aggravated thereby, which is often observed, there is a possibility of simply transforming the lithiasis into one of a different character.

Oxalate of lime lithiasis, originating in the kidney, calls for a single remedy, I think, the *Nitro muriatic acid*. I have never used this remedy in dilution, probably from habit, but find doses of from one to five drops, three times a day, promptly curative as far as the appearance of crystals are concerned. For the oxaluria, which is at the bottom of the trouble, it will rarely be cured in this manner, and of course this is the essential feature in the case. Still the mere disappearance of crystals is not unimportant, as the lodgment of one of them may be a very serious matter. The remedies that seem to exert the most influence are *Nux vomica*, and *Bryonia*, although the semeiology is so protean, that there are few remedies that may not be indicated in different cases. It is impossible to give the indications for remedies without transcribing whole pages from the *Materia Medica*. The

chief point to be borne in mind is to first correct the tendency to formation of crystals, then give the remedy indicated by the general symptoms, and correct faulty habits of life.

Phosphatic lithiasis is often temporarily arrested by the use of acids in the food, but this must not be carried too far, or a uric acid lithiasis will take the place of the alkaline. The use of remedies must as far as possible be guided by indications outside of the urinary tract, such as an osseous disease, active or latent.

Calcareo, *Phosphorus*, *Silicea*, or *Mercurius*, are oftener indicated. At the same time, as in all these cases, the habits of life must be looked into, and errors corrected.

Retained Renal Stone:—Occasionally a renal calculus fails to pass out of the kidney, or it may lodge in the renal end of the ureter, whichever may be the case, the results are the same, in the end, only differing in rapidity of development. In the first case there will be a retention of urine behind the stone, which not only continues to accumulate, and thus damaging the structures—but undergoes decomposition, and adds to the size of the calculus by accretion. Other malphigian bodies or tubules are compressed, furnishing an enlarged area of retention, and the stone acting as a foreign irritant sets up inflammatory action, rapidly destructive of the kidney. Finally, one tubule after another being obliterated, the parenchyma of the organ undergoes necrosis, from compression, breaks down, and a cystic degeneration of the organ is secured. Portions of the excreting tissues remain normal, or practically so, the effect being to continually add to the amount of fluid poured out, the cortex of the gland becoming thinned by expansion, and its function utterly destroyed. This is *hydro-nephrosis*. In other cases, the calculus may set up a rapid and intense inflammation, passing into suppuration, until the cortex forms the pyogenic or limiting membrane of an acute abscess. This is *pyo-nephrosis*. Should the calculus lodge in the ureteral opening, the consequences are the same, with the difference that they are more rapidly developed, as there is no escape for *any* of the urine, all of which is retained,

"choking" the kidney, as it is called, and inducing very rapid destruction. The consequences are various, in either case. The other kidney soon takes on compensatory activity, so that often there is no interruption in the excretion of urine, and consequently no symptoms of uræmic poisoning. Adhesions soon form between the walls of the abdomen, colon, or near viscera, and ultimately a fistula forms, with a discharge of pus and urine. The fistula, as a rule, is rarely of sufficient capacity to give exit to the calculus, which remains as a constant source of irritation, giving rise to a chronic abscess, with all the evil consequences of such a state of facts. Occasionally a fistula does not form, but pyæmia, septicæmia, or uræmia intervenes.

The Symptoms of hydro-nephrosis, are obscure to a degree, particularly in the initial stage. There is rarely any symptom of lithiasis sufficiently pronounced to call the attention of the patient, and rarely any history of nephralgia to give warning. There is always some disturbance of the urinary function, as a matter of course, but it may be so slight that no attention is paid to it. This is particularly the case when the ureter is closed, when, beyond a diminution in the volume of urine for a day or two, and some indefinite uneasiness in the back, there is no remarkable departure from the standard of health. When the calculus is lodged in the kidney, there will be, in all probability, pus in the urine, but it may well escape notice. Later, in such cases, the amount of pus will be so great, with other evidences of renal disintegration, that the sufferer is liable to call for medical aid. When the ureter itself is occluded, the amount of pus in the urine will be at all times small. When suppuration is set up there will be the customary rigor, and, if attention is attracted to the urine, a suspicion of the actual trouble may be entertained, and the renal region examined. The loin will be found fuller than the opposite side; if adhesions have formed, palpation may determine the presence of fluid, and the aspirator show its character. If the adhesions are intestinal there may be no external signs. When the destruction is far advanced, the protuberance in the renal

region marked and very prominent, the case is clearer, and spontaneous evacuation soon occurs. Even then strange errors have been made in diagnosis; caries of the spine has often been diagnosed, from the gritty character of the discharge, and the grating of the probe on the calculus. The discharge being into the colon, abdomen, or pelvis, a diagnosis may rarely be secured, at least *ante mortem*. There are cases in which an occluding calculus has become disintegrated, and suddenly giving way, permitting a free passage to the bladder of the contents of the renal cyst. I think the majority of such cases terminate, however, in the formation of a renal fistula in the loin, which may remain open and discharging indefinitely.

Assuming a case of this kind, the probe, used intelligently, will detect the calculus, which is usually removed without difficulty, by *nephrotomy*. Should the aspirator reveal the nature of the case, *nephro-lithotomy* is at once indicated. Further procedures demand a high degree of surgical knowledge. The question of first magnitude is, how far disorganization of the kidney has gone, and whether *nephrectomy* is called for, or the remains of the kidney should be undisturbed. These questions are outside of my present limit, and must be answered elsewhere.

URETAL CALCULI.

Uretal calculus refers to one that has either lodged or formed in the ureter, in compliance with a custom of questionable propriety; properly speaking, the term should be restricted to the *formation* of the stone in the ureter, inasmuch as this must always be the chief point of interest. Nevertheless, long custom sanctions this misuse of the term, and it will be made to serve the present purpose.

The *lodgment of a renal calculus* in the ureter is an accident of the most serious character. From the obstruction being complete, the destruction of the kidney by hydro- or pyonephrosis is almost certain, and much more rapidly accomplished, than when lodgment occurs in the kidney itself. Un-

fortunately the semeiology of this accident is exceedingly indefinite, so much so that positive data are rarely furnished until the mischief is quite irreparable. The usual fate of the renal stone being to pass into the bladder, and this fulfillment being announced by a sudden and complete subsidence of all pain, when the nephralgia is marked, and the termination of the attack prolonged with an incomplete cessation, a suspicion may be entertained that the calculus has lodged in the ureter. In such an event the attendant would carefully watch the development of symptoms of choked kidney, such as rigors, perhaps uræmia, fullness in the loins, etc., and promptly make a nephrotomy. In many cases the urine will contain evidences of uretal mischief, pus or blood being present in larger or smaller quantities, but in the absence of more definite signs these go for little.

The consequences of uretal lodgment, as to the ureter itself, and to the calculus, are important. When lodgment occurs at the upper part of the tube, anywhere, in fact, above its entrance into the bladder, ulceration soon takes place, and the calculus falls into the cavity of the pelvis, where it may set up a diffuse inflammation, leading to suppuration, and ultimately will find its way out through the rectum, bladder, or some cutaneous fistula. When lodgment occurs lower down, between the coats of the bladder, it will oftener fall into this viscus, and the urinary function be restored again. Such an event is the common termination, as the anatomical structure favors lodgment of the stone at this point.

As to the ureter, its future integrity and usefulness is very largely related to the location of the lodgment, and the fate of the calculus. Sometimes the tube above the calculus becomes tightly strictured, first from spasmodic muscular contraction, and secondarily by plastic exudation so that it is completely occluded. Below, a suppurative or ulcerative process is set up, the absence of urinary contact having the effect to favor disintegration of the stone, which is finally discharged into the bladder, and the inflammatory process ceases. In some cases the plastic material is later removed, and the patency of the

tube restored, but such an occurrence must be very rare, and the kidney seriously injured before it can take place.

The stone having found its way out of the ureter, into the rectum, colon, bladder, or vagina, the urinary function may go on undisturbed, although the channel may be an abnormal one. If the stone falls into the pelvis, or peritoneal cavity, the urine follows it, and thus greatly adds to the dangers of the case. In very many cases, however, the escape of the stone is followed by only a small portion of the imprisoned urine, adhesions and closure of the ureter above the point of exit being the rule. Under all circumstances, therefore, the lodgment of the calculus may be considered an accident of the most serious import, one which can scarcely be recovered from, except under the most fortuitous circumstances, the danger being greatly enhanced from the obscurity of the diagnosis.

The causes for lodgment are many. The most common, probably, is the size of the calculus being greater than the capacity of the tube. In such cases the escape of the calculus by ulceration is slow, and is only completed when the parts interior to it are destroyed. In other cases the shape of the calculus, irregular, with sharp points and angles, is the cause for unusual spasmodic excitement of the muscular fibres, and a firm retention of the stone. In such cases the irregularity of the calculus may permit an escape of some portion of the urine, and the sharp points or angles determine a more rapid perforation of the walls of the ureter. Such cases are better or worse than the former, depending upon the point of perforation, whether into the pelvis or peritoneum, or some organ which gives ready exit to the urine. Undoubtedly cases of nephralgia that have been treated by opiates and the like, are exposed to danger of retention of stone far beyond other cases, not so treated, or that are even left entirely to nature.

Uretal calculi, properly so-called, that is those that are *formed* in the ureter, have a somewhat different history and significance. The first essential, without which it is doubtful if a stone can form, is that there must be some kind of an ob-

struction (such as stricture, with more or less sacculation), neoplasms, or inflammation giving at once some exudate and a narrowing of the lumen of the tube. Being a lesion, there will always be at least a drop or two of residual urine, which must undergo some kind of decomposition, and elements of stone be thrown down. The slow accumulation of these elements has the effect to permit some attempt at compensation in the tube, and thus postpone closure of the canal to a late day, if it occurs at all. The passage of the stream of urine over the calculus has the effect to wash away portions not firmly attached, and also to loosen the whole mass when a certain degree of development has been reached. On the other hand, fortunately in exceptional instances, the calculus may be so firmly imbedded, that it cannot be dislodged by such means, and while some fragments *may* be carried away in the stream of urine, there is much greater probability that accretions may be left behind. Unquestionably there are many cases of uretal calculi that have never been suspected, as they pass into the bladder upon attaining a certain size, and never give rise to any noteworthy symptoms. I saw a case, on the dissecting table, in which a papillomatous growth in a ureter had become encrusted with urinary deposits, the ureter being enormously dilated, and the kidney not appreciably affected. The circumstances under which a uretal calculi may form are of such a character, and the symptoms produced thereby so insignificant and unobtrusive, that a diagnosis is almost an impossibility.

The Treatment, as might be imagined, can be nothing better than pure expectancy. As a matter of fact few cases will be presented for treatment until the renal disorganization is far advanced. Should lodgment of a stone in the ureter be suspected, it *might* be possible, in exceptional instances, to detect it through the rectum or vagina, in which case an incision would be proper. Ordinarily, when hydro- or pyonephrosis is established, the most that can be done is to make a nephrotomy, and either establish a urinary fistula, or if the disorganization has gone too far, a nephrectomy.

VESICAL CALCULI.

Stone in the bladder is the form in which urinary calculi are generally presented to the surgeon. Preceding paragraphs have already referred to the usual source of stone, *viz.*, from the kidneys or ureter; the other sources are the prostate, or causes operating entirely within the bladder. Among the causes purely vesical, chronic or acute cystitis, tumors of the bladder of various forms, the accidental introduction of foreign material, or the retention and consequent decomposition of a portion of the urine, are among the more common, and something in the order, as to frequency, as they are stated. A renal stone that has safely passed through the ureters, usually passes out of the body without difficulty. In some cases, however, it may lodge in a fold of the mucous membrane, and receive fresh accretions until too large to pass through the urethra. The stone once formed, is either free in the bladder, or "encysted," as it is called, that is surrounded by folds of mucous membrane, which retain it in one position, the swollen mucous membrane rising up like a wall around it. At times, and indeed usually, there is an accretion continually going on, until a large stone may be formed, projecting into the bladder, and firmly fixed. It is possible for such a stone to attain enormous proportions, and yet no symptoms produced; after a time it may become dislodged, or broken, and sudden and urgent symptoms at once appear.

In view of what has been said elsewhere of the formation of stone in general, it will not be necessary to enter at any greater length into the chemistry of vesical stone. The chief interest centers in the semeiology, and diagnosis.

The first indication of stone in the bladder is usually an irritation and itching of the meatus urinarius, or the margins of the prepuce, inducing rubbing or pulling on the foreskin. Hence when young boys are found with a red and irritated, particularly an elongated prepuce, further examination for stone had better be made, or at least the case watched for other indications. This gradually increases, day by day, until

it amounts to a pain. Associated with this are symptoms of vesical irritation, there being frequent demands to urinate. At first nothing unusual beyond the frequent micturition will be observed, but later pain will occur, at the close of the act, in the perineum, extending along the urethra to the meatus. There will also be a sudden arrest in the flow, in the majority of cases, from the falling of the stone into the neck of the bladder, leaving the act uncompleted. These symptoms will increase in severity, until the constant urging to urinate, day and night, the increasing painfulness of the act, and the disturbed sleep and generally disordered functions consequent thereupon make life a burden, the face becoming haggard, and the expression one of suffering. As the stone increases in size, its motion over the surface of the bladder sets up a more or less violent cystitis, much aggravated by the contusion caused by forcible propulsion against the neck of the bladder at each act of micturition; the urine becomes loaded with mucus or pus, sometimes bloody, and the bladder contracted and thickened. Later in the case, when the bladder is emptied, or nearly so, it shuts down, almost spasmodically on the stone, causing the most intense pain, which continues until some amount of urine is deposited, when shortly the urging to urinate will commence, followed again by the horrible pain. In the late stages the suffering is almost constant, the contraction and thickening of the bladder diminishing its capacity very greatly.

There are cases, however, of large vesical stone, in which none of these symptoms occur, or in a modified form. This immunity is due to *encystment* of the stone. There are other cases in which the symptoms, in an aggravated form, come on suddenly, from a sudden release of a stone previously encysted. The most embarrassing modification in semeiology, because, without previous information, an error in diagnosis might be suspected—is the sudden disappearance of symptoms from a stone becoming encysted, or practically so, by falling under the prostate. Subjective symptoms, therefore, are peculiarly unreliable in vesical stone, as they are for the most

part, in practice—and other means must be taken to reach a reliable diagnosis. It will be observed that while the symptoms, as given above, are such as would naturally be produced by a solid foreign body in the bladder, they are also pathognomonic of cystitis from other causes. These facts must be impressed upon the mind, because there may be all the *symptoms* of stone, and none present, and no symptoms at all with a stone of large size.

It will not be safe to base a diagnosis on these subjective indications. The bladder must be explored, by proper instruments, every part of it gone over, notwithstanding there are sources of error even then. This process is called "*sounding*."

The *sound* is made in many forms, the chief consideration being an expanded head, to give surface for contact with the fingers. The term "*sounding*" misleads the student, as it is not so much a *sound* as a sensation communicated to the fingers that is elicited; in fact in many cases there is no sound at all. The instrument is made of various calibres, and while some are stiff, others are easily bent into any desired curve, which is much the best arrangement. Bearing in mind the sensitive state of the bladder, and the intolerance of distension, the examination had better be made under an anæsthetic. The patient being prepared, warm water is to be injected into the bladder, in sufficient quantity, remembering its diminished capacity. The sound is to be then introduced, precisely as the catheter, being first warmed and well oiled. The beak is first to be turned under the prostate, as it is there the stone is usually found; if nothing is felt, it is then to be turned and swept over the whole of the internal surface. A word of caution is here needed. The directions for sounding laid down in most of the text-books are misleading. The sound is not to be rotated on its axis, as there will be danger of lacerating the urethra, which grasps it quite firmly. The direction of the beak is changed by sweeping the handle round in a circle, the prostatic portion of the urethra representing the pivot. This does, at the same time, rotate the sound on its axis, so that when ready to withdraw it, glance at the mark on the handle

to see which way the point is turned. If a stone is found, there may be a slight "click" heard, but the commoner sensation is a feeling communicated to the fingers. When the sense of touch has been sufficiently educated, the character of the stone can be determined by the sound, whether a hard uric acid, or oxalate, or a soft phosphatic one. Should no stone be found in the first examination, others must be had, the patient occupying different positions, sitting, standing, lying on the side and the like.

The description given of the process might lead to the conclusion that the operation gave certain and definite information; such is far from being the case. In the first place it requires skill in the manipulation of the instrument, an educated tactile sensibility, and a certain condition of the stone, as to size, position, and even composition. The sources of error are many, so that the most expert surgeons have erred, diagnosing stone where none existed, and failing to find one when present. The commoner sources of error are as follows: Mistaking the promontory of the sacrum for a phosphatic stone; the sound striking on a ring on the finger of the surgeon, or a button on his own or the patients clothing, or some dangling ornament on his watch-guard, or the like. A stone may be overlooked, on the other hand, from its being encysted, with the mucous membrane rising high above it; or it may be of very light specific gravity, and float in the water; or very small. In short the sources of error are so many that it has passed into an axiom, "never make an operation for stone without having one in your pocket, to show the family, if you do not find one in the bladder."

The Treatment is purely operative, there being no field for medicine at all, except in the after-treatment, which is as laid down in all our text-books.

Formerly it was considered an unjustifiable procedure to make an operation without demonstrating the presence of the stone at the time. Now, however, it is proper to open the bladder for purely diagnostic purposes, in fact cystitis has been cured in that way. Nevertheless, as the laity are not

fully informed on the subject, precautions must be had to show some result, and to "confirm the diagnosis."

PROSTATIC CALCULI.

These are calculi found in connection with the prostate, of two kinds, one of them urinary, in the line of our present enquiry—the other unconnected with the urine in any way. The proper *urinary* calculi, having relation to the prostate, for all practical purposes may be considered as vesical, the symptoms, prognosis, and treatment being the same. So also, to some extent, with relation to genesis, a nucleus of some kind being *sine qua non*. The commoner origin, probably, is from the lodgment of a urinary stone between it and the bladder; at other times an encysted vesical stone, in close contiguity, may grow into the prostate. There have been cases in which the cavity from an abscess, or the partly healed wound from a perineal lithotomy has afforded lodgment to urine, which has undergone decomposition, and furnished the nucleus. In most cases, the presence of the nucleus sets up an inflammation or chronic irritation of the prostate, which increases its excretion to a degree that the later accretions to the stone are calcareous matter furnished by itself. The greater part of all stones in this region are consequently formed of carbonate of lime.

The *symptoms* produced are not at all pathognomonic, not infrequently there are none of any prominence. There are the ordinary symptoms of prostatitis, which leading to an examination of the gland through the rectum, will reveal concretions, in many cases. In some instances the stone may be situated so deeply, that it cannot be felt through the rectum; in others it may project on the urethral or vesical side, so that the passage of the sound or catheter will detect it. In any case, a diagnosis being made, the sole indication is to remove it precisely as though it were vesical, *viz.*, by perineal lithotomy.

True Prostatic calculi are thus described by POLAND (HOLMES *Syst. Surg.*, iv.): "The prostate gland, like other

glands, is liable to an inspissation of its secretion, producing small, yellow, sometimes red, or colorless bodies, scattered throughout the follicular structure. These, at first, are said to consist of organic matter which VIRCHOW believes to be derived from a peculiar, insoluble protein substance mixed with the semen; but sooner or later these formations are believed to irritate the mucous membrane, causing phosphatic depositions which become encrusted upon the organic matter, and thus the genuine prostatic calculi are formed."

Cases are noted in which these calculi remain single, attain large dimensions, and ultimately convert the gland (by absorption and perhaps suppuration), into a more or less thin-walled cyst. In most cases they are multiple, sometimes to the extent of converting the whole gland "into a stony mass." In some few cases the portion of gland so affected has become separated from the remainder, and falling into the bladder set up symptoms of vesical stone. The *treatment* is purely surgical.

URETHRAL CALCULI.

Stone in the urethra originates very much as stone in the ureters, *viz.*, either by lodgment of a renal stone (or portion of a vesical stone), or fragments left after a lithotrity; or it may originate in the canal from morbid changes that induce retention of urine, and thus favor decomposition. They are found at any part of the canal, perhaps among adults at the membranous portion, and among boys in the fossa navicularis. The accessibility of the urethra, both for palpation and examination with sounds, renders a diagnosis usually a simple matter. As might be expected cases of stricture with sacculation behind the constriction furnish the greater number of cases.

XVIII—TUMORS

TUMORS form the subject for almost innumerable essays, treatises, and books, constituting a mass of literature that is fairly appalling, not only in its magnitude, but in the confusion growing out of the diverse doctrines of etiology and related topics. Viewed from a purely clinical side, there is little to add, it would seem, to what has been quite generally accepted; from all other points of view, there is a remarkable lack of harmony, notwithstanding the literature, even now pouring from the press in a constant stream. From all the circumstances, as above, it may be permitted one who is not without considerable experience, in the laboratory as well as the clinic-room, to have views of his own on these disputed questions. Something, therefore, in the following pages may, and probably will, fail to meet the approval of many whose opinions are entitled to respect. The attempt will be made, however, to treat the subject in a judicial manner.

A tumor may be defined, as a new tissue, laid down in more or less intimate relationship to existing tissue; not a hypertrophy, or necessarily formed of elements derived from the locality. It is a *swelling*, as the term implies—but it is not a local redundancy, and rarely an outgrowth.

By *hypertrophy* is understood an overgrowth of tissue, the elements remaining as in the normal type; a simple increase in magnitude or number of these elements. Tissue that is formed, that is adult tissue—is no longer cellular; tumor tissue remains cellular, and thus represents immaturity. In other words, a tumor stands as an excessive production, with deficient organization. There is a more satisfactory outcome, as to organization, than occurs in inflammation, or abscess, but it

is so far from perfect, that, as RINDFLEISCH puts it, "it is a mere caricature." The more or less embryonic histology of the tissue, gives embryonic characters to its growth. It grows more rapidly than normal tissue does, and has no limit, or termination. The tumor either grows indefinitely, or after attaining a certain organization, it breaks down, and is dispersed throughout the body, cast out entirely, or is the beginning for some other form of morbid action.

The first question to be considered in the study of tumors, is the *effect on near parts*; how contiguous structures are affected by the neoplasma. The consequences are dependent upon the grade of development of the tumor, in other words its malignancy, as a matter of course, but there are others, depending upon different considerations. Perhaps they can all be included in the following: Absorption, Displacement, Inclusion, Infiltration.

Absorption, or destruction of the tissues having anatomical relationship to the tumor, occurs from two causes, and depends somewhat upon the character of the tissues. Soft tissues are compressed, or put in a state of tension, in either case atrophic changes being the result. The final result will depend upon the rate of growth in the tumor. If it is rapid, and continuous, atrophy of structures so acted upon will likely occur. If it is slow, or intermittent, the parts gradually accommodate themselves to the new relations, and are more likely to become hypertrophied. Again the function of the parts involved will play an important part. Thus a muscle that is active, and essential to common function, like the sterno-mastoid, will yield very slowly, and may preserve its structural and physiological integrity even in the case of large, rapidly growing, tumors. Others, such as the platysma, will more likely undergo atrophy. Nerves, as being less elastic than blood-vessels, will suffer more than the latter. Another fact is important to notice. In a contest between a growing elastic body, and an inelastic solid one, while the former is modified by the latter in its form, the latter is absorbed or eroded. Frequent examples are seen of ribs, cartilage, or even the bodies of ver-

tebræ, eroded, or absorbed, by aneurysmal tumors. As a rule, of course, tumors grow faster in the direction of least resistance, but they grow in all directions. This has the effect to retard absorption, to some extent, but does not, by any means, prevent it. Absorption, usually, is a feature in non-malignant growths.

Displacement, is caused by a tumor growing between contiguous parts, and pushing them out of their proper relation. Surgically this is an important matter, as the topography is so altered that operative procedures are apt to be embarrassed. Particularly is this true, in the case of tumors of the neck, when not only are nerves and blood-vessels often found where not expected, but the alteration in the muscles removes the most constant guides to organs and structures that are exposed to injury. In all such cases, some absorption is likewise going on, and the embarrassment to the operator is intensified, as structures that it is desirable to avoid, are not only out of their proper position, but so altered by atrophic changes that they are not readily recognized. Displacement is an indication of non-malignancy, as a rule, yet in the early stages of malignant tumors it may be present.

Inclusion, is a term expressive of the fact that a tumor envelopes or grows around some near part. This is rare in true tumors, but it may occur in cases of rapid growth. It is commoner in the case of glandular tumors, where a gland becomes converted into a tumor, such as parotid fibroma, where the trifacial nerve, and the internal carotid artery are found running up through the tumor mass. In other cases such an event is unlikely, as the involved structures would be displaced or absorbed, oftener than included. Such tumors may be either innocent or malignant, oftener the former, if the term is used to indicate some preservation of function in the included part.

Infiltration means that the elements of the tumor have entered other structures, displacing the normal tissue. For instance, whether a part is infiltrated or included, the loss of function is apt to be the same. In the latter case, however, the change in structure is purely atrophic; in the former the tumor

elements have found their way into the tissue, and displaced the normal elements more or less completely. Such processes are always malignant.

As to the organism as a whole, as will be shown later—the considerations are quite different. In some cases nothing but discomfort from weight, disfigurement, or interference with functions will result, particularly in restricting motion of joints. In others, pressure effects are serious, obstructing canals, as the air passages—or displacing viscera. In both of these cases the disability is local, but is due to purely mechanical causes. Such tumors are nearly always innocent in type and clinical features. In another class of cases, however, the tumor elements migrate, and infiltrate distant parts, parts that are not in anatomical relationship to the site of the tumor. These are quite invariably malignant. In one case we have a morbid action, a pathological state; in the other, simply consequences of mechanical pressure.

ETIOLOGY.

As is so generally the case, the causes for tumor formations are to be considered under two heads, the *exciting* and the *predisposing*. The latter are, in every way, from all possible points of view, the most important, as without their operation a tumor would be impossible.

Exciting Causes: The first essential in the development of a tumor, is some hyper-nutrition, in a restricted territory, and of only a certain degree of energy. If too energetic, inflammation and suppuration would be imminent; if somewhat less so a simple hypertrophy: if insignificant there would be no result. Added to this essential, there must be something disorderly in the organization. Traumatism, we have seen, is a simple provocation for repair. The repair being completed the unused material is absorbed, or otherwise disposed of, and the new tissue starts on a slow assimilation to the function and structure of the part in which it is deposited. In the case of a tumor, the elements of repair are furnished, but more than

scar tissue, and at the same time less—is the result. The traumatism usually is of minor degree, and frequently repeated; or, if inflammation does result, it must be low grade, and somewhat chronic in type. We find the rule to be, in the case of innocent tumors, at least, that they are more common on parts of the body subjected to more or less constant irritation, as the shoulders or hips; or those parts in which function is accompanied by pronounced irritation with hyperæmia, as the stomach (particularly the pylorus); or parts where unlike tissues meet, as the commissure or vermilion borders of the lips. In cases that might be considered more truly traumatic, the repair should be irregular, as from faulty coaptation, or inclusion of foreign bodies, or possibly irritation from the dressings, either during repair, or of the scar, later. But under all of these conditions the *absolute* essential is a lesion of minor degree, and only a hyper-nutrition, which must also be of chronic character. Even with all these conditions furnished, a tumor will not result in the vast majority of cases; the predisposing factors are the absolute essentials.

Predisposing Causes: The conditions, whether constant or transient, that render one person more liable than another to the development of a tumor, must, in the very nature of things, be of the utmost importance as furnishing accurate knowledge of the morbid processes going on, as well as determining treatment. It can readily be conceived that a tumor which stands as a symptom of a general dyscrasia, must have a very different appearance to one that represents a purely local outgrowth. Just what these predispositions are, is not always a matter of easy solution, either in general or particular. Do we inherit the elements of tumors, or a weak tissue, or are they representative of abnormalities in ovular evolution? As to the large family of malignant tumors, there are all these, and many other theories extant. It seems probable that the facts will be found, sometime, to be in harmony with all three of them; that is, there is no single predisponent; it differs in different cases. For instance, to take up the last theory first: MONOD and ARTHRAUD, some years ago stated

the proposition, that the development of the ovum was rarely accomplished in an ideal manner; that the large majority of ova never reached their destiny at all, and the few that did so arrived there over a more or less disorderly route. To be more particular: Assuming the fertilization, and the inception of evolution, a perfect progression would mean the development of the four blastodermic layers with strict reference to each other; that is, that the interior ones would always be smoothly applied to the inner surface of those exterior. It is assumed by them, that such is rarely the case; that a layer is thrown into folds, when too large, or attenuated, at some points, when too small, these points remaining as centers of imperfect development. It may be that later in the history of the case development may go on, but it will be that much behind the remainder of the ovum. It is assumed by them, that the defect may remain until the individual has reached any period of life, and remain latent, to be awakened into activity by some accidental occurrence. The results, as to type of tumor, depend entirely upon the particular layer involved. The epiblastic layer will give tumors of integumentary elements. The mesoblastic, and hypoblastic, will furnish elements normally related to those layers. They divide all tumors into two grand divisions, the *tumors proper*, in which the elements are derived from sources given above, and which represent tumors that are in some sense hereditary, or at all events congenital. The second class are called *inflammatory* (or trophic) *neoplasms*, and are of recent, accidental origin. Under the first head a classification is made, as follows:

Teratoma, or "monstrous" tissue, due to an involution, or some defect embracing all the layers of the ovum.

Mixed tumors, where two layers are involved.

Pure tumors, where a single layer is at fault.

The histological character of the teratoma would be unlike any tissue in the body, containing elements more or less derived from all the layers of the blastoderm. While in pure tumor, they would be such as would come from a single layer, and thus be more "typical."

The second class, the trophic or inflammatory neoplasms, are representative of a simple proliferation from connective-tissue, epithelium, or endothelium.

The theory is ingenious, and quite captivating, but in addition to its being a *pure* theory, with very formidable difficulties in the way of proof—it is not capable of satisfying all the conditions. Certain forms of tumor can be readily accounted for in this way, such as the dermoid cyst, but many others give histories that are not at all in harmony therewith.

As to the *inheritance of a weak tissue*, the teaching of RIND-FLEISCH takes first rank. It is a fact well known, or at least quite generally accepted as such—that structural defects or peculiarities, after a certain time, become constant in the offspring, an ebb and flow occurring for a time before the type is confirmed. We know of many cases, such as supernumerary fingers, web-fingers, and the like—in which families, even in somewhat remote relationship, have some distinguishing feature. Occasionally there are relapses to a primitive type (atavism). It is conceivable that certain defects due to pure accident, will impress themselves so strongly on an organism, that the progeny will have, if not a similar one, probably a modified function. Of course a modified function is the result of imperfect structure, and yet the latter defect may be microscopic, perhaps not even capable of demonstration. An example is found in the case of hernia; the long traction on the mesentery, in cases of long standing, results in lengthening of this structure. The offspring may inherit the long mesentery, but not the hernia. In course of time the hernia will probably appear, the conditions being so favorable. Again, on the other hand, a neurosis may be perpetuated in the offspring, and some abnormality may later appear. One of the commoner examples of “weak-tissue,” is found in cases where parts or tissues are preternaturally vulnerable, with no structural explanation of the fact. We are all familiar with instances, in which individuals are peculiarly susceptible to morbid influences, and yet there is no appearance of anything, as far as structure is concerned, to account for it. What is true of the organism as a whole, can very readily be true of parts of it.

Finally, is it possible to *transmit the elements* of a tumor directly to the offspring? Possibly, but there are few, if any facts to support such a hypothesis. The common sentiment, I think, is that no form of morbid action, unless it may be syphilis, is transmissible in this way. The question of predisposition, therefore, must be left unanswered, as to the issues raised in the foregoing. Other considerations, however, may be stated more positively.

Sex has an undoubted influence, women presenting more cases of tumor, while men give more variety. This is explicable when we remember the physiological differences. Ovulation, menstruation, lactation, and child-bearing furnish crises in the lives of women that never occur to men. The frequent irritation of the organs concerned in these various functions, furnish all the predisposing essentials to tumor-formations, the predisposition thereto being present.

Age, as influencing the growth of the body, the readiness of repair, and the perfection in the result, exercises a very important influence. In early life, tumors of the fast growing type, and embryonic organization, are common, as the various sarcomata. In adult life, the process is more deliberate, and the organization more typical, giving benign growths. In old age, the material is sparingly furnished, and the organization low; the surrounding tissues are vulnerable, of low resistance, and malignant growths are common.

Occupation, as far as it imposes irritation on tissues habitually, or interferes with function from habitual position, frequently cause tumors, of various kinds, depending upon the age of the individual, and the predisposition. We often find fatty tumors on parts constantly subjected to slight irritation, as the shoulders or hips: or cysts, as adventitious bursæ, on parts subjected to greater irritation, as the hip, shoulder, elbow, etc., in the case of miners.

Mental Conditions are probably more responsible for the type of a tumor than is commonly supposed, although the data are quite incomplete. It is assumed by many good authorities, that mental depression, growing out of isolation,

or grief of any kind, such as family losses by death, or business reverses, are productive of malignant transformations of existing tumors, if not directly causative *ab initio*.

Tissues, not so much kind, as location, certainly play a most important part. Thus parts that are frequently irritated, will more readily take on some kind of abnormal overgrowth, than others of the same character more happily situated. Or parts that are on the border line between tissues of unlike character, when hyper-nutrition occurs, furnish elements which give a typical organization. We know it to be a fact, that the secretions of the body are quite generally toxic when out of their normal relation, and innocuous when in their proper place. Thus the bile, urine, saliva, or blood are absolutely bland in their proper receptacles, or ordinary channels, but produce the most serious consequences when accidentally brought in contact with other tissues, as the peritoneum, or even the integument. The same fact holds good in the case of tumor elements. An internal proliferation of epithelium will give a malignant tumor or ulcer. Thus when unlike tissues are similarly affected by hyper-nutrition, atypical organization occurs, and we have malignant tumors resulting. Thus tumors of the pylorus, cervix uteri, commissure of the lips, and the like, are usually malignant.

PATHOLOGY.

There can be no question, that in the majority of instances, tumors commence as purely local affairs. I do not believe that the character a tumor will later assume is determined in the beginning. All that does occur is a simple hyper-nutrition, a purely local cellular activity, the ultimate characters being determined by other considerations. Of course there are forms of tumor that are malignant or otherwise from the moment the process commences, but even then they are local, as to formative forces, and for a longer or shorter period of time innocent. It was long before this conviction was forced upon me, all my teaching having been of quite a different character. The first step, therefore, may be assumed to be a strictly

local overgrowth, called into activity by a frequently repeated traumatism, slight as to intensity. The products are organized, instead of being absorbed or otherwise disposed of, as would be the case ordinarily, and the kind of tumor resulting will depend upon the degree of organization attained, the character of the predisposing influences, and the nature of the parts involved, to some extent.

The later history of the case depends upon many things, but chiefly, I think, upon the manner of development of the tumor. Growing rapidly, there is a promise of low organization; growing slowly, it will be of a higher grade. A steady growth, is likely to give a typical character to the tissue, while intermittency will probably result in something abortive. It is thought by many that systemic invasion depends upon the presence or absence of a capsule; a capsule being formed the tumor is probably innocent, perhaps largely from the barrier thus furnished to infiltration. The capsule would be much more likely to occur in slow, steady growths. The question of infection is, however, solely determined by the malignancy of the growth. The essential difference as will be shown later, is in the tendency of the tumor to disorganization. In some tumors, the innocent or typical group—growth goes on indefinitely, almost without limit, the tumor finally ceasing to grow, or undergoing some form of degeneration, from the poverty of its nutrition, blood-supply. In others they early break down, and the elements are dispersed, through the lymphatics, forming foci in remote regions, with reproduction of parent tumor. The question of secondary growths has much to do with the question of recurrence after removal. A portion of a tumor may undergo atrophy, while other portions take on an accelerated growth. At other times, in non-capsulated growths, there is infiltration of near parts, and migration to distant localities. After removal, it often happens that a small portion remaining will serve as a nucleus for a recurrent growth. Hence, it would appear, the elements of a tumor are little disposed to take on purely normal characters, or to assimilate themselves to contiguous parts; they

are entirely without purpose in the organism, and when portions of them are transplanted, with vitality unimpaired, they organize into tumors, like the parent type, with no relation to the part in which they are found. By dispersion, therefore, a tumor originally purely local, may infect the entire organism. Or a tumor may, from its magnitude, make such drafts on the body for its maintenance that the general health will suffer. Again, it may undergo degeneration, and the sloughing and suppuration incident thereto will exhaust the vitality. Still again, by pressure upon, or inclusion of important structures, the health of the body may be impaired, even its existence threatened, by purely mechanical means.

Classification is so closely allied to pathology, that it may well be considered an essential part of it, inasmuch as it includes questions of physical characters, gross and minute, as well as clinical and natural history.

First as to **Density**:—We divide all tumors into *solid* and *cystic*. The former need no description, the term being self-explanatory. As to the latter, however, there is much that might be written. A *cyst* is a hollow tumor, the cavity being filled with material of differing consistency, from fluid to semi-solid masses, derived from the normal secretions of the part, more or less altered. Thus one scheme of nomenclature has reference to the character of the contents, *e. g.*, *serous*, *mucus*, *hæmorrhagic*, *atheromatous*, *sebaceous*, *dermoid*, and the like. For practical purposes such a classification is of little value. Another classification is into “simple” and “compound;” or “unicysts” and “polycysts,” also known as “multilocular” and “monocular.” Still another classification is into “barren” cysts, which are single, or “proliferating,” which are polycysts, with a further classification of the latter, into “exogenous” cysts, where the secondary cysts grow from the exterior of the parent cyst; or “endogenous,” where they grow from within, into the cavity. The most useful classification, it seems to me, to which all the others may be considered subsidiary, is into *natural*, and *artificial*.

Natural Cysts, are those which form in a part already

cystic, often from an occlusion or stenosis of the duct, or common outlet, giving a retention of the secretions, and known as "retention cysts." Again the duct will remain patent, but a hyper-nutrition furnishes an amount that the duct cannot carry off. The former *retention cysts*, may be purely accidental, stricture of the duct being due to traumatism in many cases, and thus having no pathological significance. The others, represent some pathological state, and are therefore of more interest to surgical pathologists. Ranula and sebaceous cysts are representative of the former class; and ovarian cysts, and hydrocele represent the latter.

Artificial Cysts are those that are formed in parts not naturally cystic, as occurs in the cystic degeneration of solid tumors, common in the case of fibroma; or an accumulation in connective-tissue spaces. Some writers do not consider these latter as cysts at all, or speak of them as "false cysts," or "pseudo-cysts."

Another form of cyst, in its natural history a *natural* or "true" cyst, is the so-called *dermoid cyst*, which claims a little more careful consideration. It will be remembered that the theory of MONOD and ARTHRAUD, referred to in an earlier paragraph, of blastodermic involution, was stated to be a sufficient explanation of the genesis of some forms of tumor, while probably insufficient in the case of very many others. The most notable of the former variety are these dermoid cysts. The term means, a cystic tumor, the contents of which are adult elements, entirely out of relation to the part where found. The usual contents are hair, in balls, or matted together by sebaceous material, and portions of bone, or teeth. Almost any integumentary structures are found, but oftener the above. It was supposed, at one time, that these tumors were blighted ova, representing either a super- or double-fœtation, in which one ovum had become included in the other. At another time, it was taught, that the tumor was a blighted ovum furnished by the patient in whose body it was found. Certain facts, however, have utterly contradicted both of these theories. Such tumors have been found in both men and

women; young children, as well as adults; and in regions entirely outside of the genital tract, such as on the back. The external appearances are not at all different from other forms of tumor; it is only when the contents are examined that anything peculiar is noted. These are various, as already stated, and often the elements are found to be normal in one sense, (as to structure), and abnormal in another, as to amount. Often the masses of hair will be enormous, double that utilized in the body; teeth will be found, in sufficient number to supply two individuals. Certainly all the facts as they appear to the clinician, would bear out the theory that there was an arrested development of one, or more, of the blastodermic layers, the process starting up later, in obedience to some excitant, and growing with the rapidity characteristic of embryonic life, soon overtaking the rest of the organism.

Attachment: A *sessile* tumor, is one that is attached by a broad base. A *pedunculated* one, is where the attachment is narrow, or constricted. Probably all tumors commence as sessile, the pedunculated character being due to many causes. The common process is, where tumors grow into a cavity, as the bladder, uterus, stomach, or pharynx, from above, or a position where they will be pendulous—by traction from weight, the attachment is attenuated, and constricted, often to an extent that ultimately separates them from their matrix altogether, the attachment being the attenuated lining membrane of the part. At first the blood-supply is furnished through the pedicle, but as the process advances, this is gradually cut off, and new vascular connection is made between the tumor and}overlying structures. A pedunculated tumor is rarely malignant, perhaps never. Sessile growths may be either innocent or malignant.

Relations.—The relations a tumor sustains to near parts are of the utmost importance in determining malignancy, and consequently in the selection of treatment. In this classification the terms *encysted*, or *encapsulated*—and *diffused* are used. The former having an envelope, or capsule of some kind, separating it from surrounding parts, the latter being more or

less incorporated with near structures. As to malignancy, the encapsulated forms are oftener innocent, the diffused the reverse, although there are instances to the contrary in both cases. The question of interest is the manner in which this capsule is formed, whether *natural* or *adventitious*, as the clinical characters, as to malignancy, are intimately connected therewith. It will be noted, at the outset, that while innocent tumors are encapsulated, as a rule, yet malignant ones may be also, in the commencement, the capsule being destroyed later. The *natural capsule*, would be such a structure as occurs in a gland, the tumor gradually displacing the elements of the gland retaining the capsule. In some instances the capsule remains, accommodating itself to the growth of the tumor; in others it will disappear by absorption, and the tumor become diffuse. In the former case, the tumor is probably innocent, or if malignant histologically, is innocent clinically as long as the capsule remains intact. In the latter, the tumor is oftener malignant, although in rapidly growing tumors it may be innocent. Another form of natural capsule will be noted where tumors develop in cavities, or spaces beneath dense fascia, or under broad muscles. Here the histological characters of the capsule will become gradually modified, adhesions will form between it and the tumor, and the structure remain as a capsule pure and simple, having lost all of its original character and function. Such tumors are oftener malignant, although they may be innocent. When malignant, however, the capsule is very apt to be destroyed later, and the tumor become diffused.

Adventitious Capsules are formed in two ways chiefly, possibly three. In one case, the growth of the tumor being slow, the peripheral cells become organized, and assume fascia-like characters. Again, there may be a proliferation from the surrounding parts, possibly an inflammatory exudate, and a membrane is formed precisely as occurs in pelvic abscess as a limiting wall. Still again, the growth of the tumor will compress overlying tissues, attenuating them individually, but compressing and condensing them into a single layer. Later

the irritation from the increasing size of the tumor will set up a cellular proliferation, and the perpetuity of tissue confirmed, but as something very unlike its original character and purpose. In malignant growths, therefore, in parts where a natural capsule is not to be looked for, an adventitious one, if formed at all, must be very short-lived, and of feeble organization. From the above facts, it would appear that the absence of a capsule would quite surely indicate malignancy, while its presence in tumors of any size, or that existed for any time would quite as surely promise innocency.

Form:—All tumors have a tendency to the globular form in their incipency; as time goes on they assume various forms, depending upon their surroundings, the manner of growth, and the clinical characters. Thus an innocent tumor will preserve the globular character, as a rule, until it meets with some resistance, as the walls of a cavity, or dense fascia, when it takes a form determined by the character of the obstruction. A tumor may, again, by some irritation acting upon one part more than another, grow more rapidly in one portion than another, and thus assume an irregular form; or it may be pendulous, and assume a pear-shape; or it will meet less resistance in one direction than another. It may, finally, assume a shape characteristic of its type, as the square form so common to scirrhus, or the nodulated characteristic of chondroma or encephaloma. As a rule, the more regular the outline, and the smoother the surface, the greater is the probability that the tumor is innocent.

We now reach the final classification, and the one essential, above all others, to a proper understanding of the subject. It is difficult to separate this from other classifications, but there is no convenient word to express it. The whole matter of classification may be included under two heads, the *clinical* and the *anatomical* or histological. Sometimes they have been called the “English” and the “German.”

Clinical Classification is based upon the natural history, macroscopic characters, and manner of growth very largely, tumors being classed with reference to their malignancy.

From this point of view there are two great families of tumors, those that are malignant, and those that are not. Strictly speaking, however, there is an intermediate class, partaking of some of the features of both, so that the custom has been to classify tumors, under this system, as *innocent* (benign, non-malignant), *semi-malignant* and *malignant*. The advantage in this method is, that some conception of the *kind* of tumor, as to malignancy, can be had prior to operation, an important consideration as to probability of recurrence, and the possibility of there being systemic infection. Furthermore the kind of operation to be made, whether with sacrifice or saving of tissue, will be determinable by the ability to place the particular case in its appropriate class. There is a disadvantage, however, but one of very minor importance, in the inability to determine the exact species. For therapeutic and prognostic purposes, however, this amounts to but little. The characters by which the malignancy of tumors can be determined are something as follows:

Non-Malignant.—Nearly, or quite all the cysts, especially the “natural cysts,” are found in this group. Also the pedunculated and encysted. If tissues are simply displaced, included, or absorbed, and not infiltrated, the presumption is always in favor of innocency. There must be a careful interrogation of symptoms of systemic disturbance, to distinguish between those due to simple “pressure effect,” and those to dispersion or migration. Furthermore this class of tumors are quite generally single though this is not by any means an invariable rule. Pain is, se’dom a symptom, and if there should be any, it is probably due to pressure or tension of nerves, and very likely to be reflex, or at all events evidently not in the tumor itself. The tumor is movable; near parts are not implicated; the skin is non-adherent, and not discolored; the growth is irregular, or rather, intermittent, and slow. In shape they are usually symmetrical, or retain the shape given them by their surroundings. There are no deposits at a distance, no glandular infiltration, and no “cachexia.” When removed they have no tendency to recurrence, unless some

portions are left behind. They do not destroy life, unless it may be by pressure on important structures. The most notable of the more constant features, probably, will be the tendency to grow indefinitely, rarely undergoing degeneration, unless some accident occurs that interferes with their nutrition. In addition to the cysts the most common types of innocent tumors are the fatty, the myomatous, fibrous, and the like. It is generally considered to be a symptom of benignancy, when a tumor is very large. Certainly the rule is, that the larger the tumor the more certainly is it not malignant. They occur at all periods of life, but oftener in the adult subject; on section they resemble normal tissue.

Semi-Malignant: -These tumors are oftener seen in young subjects, but occur at all periods of life, more rarely in advanced age. The growth is rapid, sometimes intermittent, but oftener continuous. They are painful, have a tendency to destroy life, and always accompanied by some marked depreciation of health. They are irregular in form, deeply adherent, diffused; soon implicate the skin, which becomes discolored and traversed by tortuous veins; extend by secondary deposits in the near neighborhood, and have a marked tendency to undergo degeneration, breaking down into destructive, and persistent ulcers. After removal they are prone to recur, either as a reproduction of the tumor, or an ulcer, but usually in the scar. It is possible for a benign tumor to undergo a transformation into a semi-malignant one, from causes not perfectly understood, but probably from interference with its nutrition, not sufficient to destroy its vitality. This seems reasonable from the fact that the structure is embryonic, of low organization. In this group will be found the sarcomata, of various kinds. Section shows resemblance to embryonic tissue.

Malignant: This group of tumors are the so-called "carcinomata," or what is popularly known as *cancer*. They have characters that are almost unmistakable, when fully developed, but which may be less pronounced in the early stages. They are to be studied in two forms: the *occult* and the *open*, or, in

other words, the *tumor*, and the ulcer. It also serves a useful purpose to classify them as *primary* and *secondary*.

The Tumor is usually diffused, of slow, steady growth, soon becoming attached firmly to adjacent parts: of square outline, or very irregular form, occurring, for the most part, after the middle period of life. They have a slow steady growth, infiltrating near parts, and have a tendency to dispersion, evidenced by glandular enlargements. Systemic disturbance, or *cachexia*, is due to this dispersion of the elements, and the same causes give secondary deposits and tumor-formation in distant parts. On section such tumors are seen to be more highly organized than the semi-malignant group, but unlike any normal tissue of the body. There is a marked tendency to degeneration, and the ulcers thus formed are deep, inveterate, and painful. There is little question, in my mind, that such tumors frequently appear as a degenerated recurrence of some less malignant form. At least it is apparent that all tumors commence, as a rule, with innocent characters, so far as mobility, encapsulation, and relation to near parts are concerned. There are cases, not few in number, when frequent removal has occurred, where each recurrence has been of a lower type than the preceding; this gives color to the supposition that degeneration in type is not improbable, to say the least. The terms *primary* and *secondary*, as applied to the tumor form, are self-explanatory, at least as to the former. The latter refers to tumors that appear as recurrent, usually in the scar or its near neighborhood, or in distant parts by migration or dispersion. The usefulness of the classification lies in the fact that secondary growths are proofs of systemic infection, and operation of any kind is therefore contra-indicated. There are many varieties of malignant tumors, and it is commonly held that the secondary growths are quite generally of lower type than the primary.

The *open* stage, is that of ulceration. Shortly before this commences, if not before, the surface of the tumor becomes uneven, nodulated, and the integument becomes firmly attached

so much that it cannot be raised up. The surface is covered by tortuous veins, and the skin discolored. Deep attachments also form, so that the mass is absolutely immovable. Later, the nodules soften on the apex, the skin is destroyed, by a sort of ulcerative process, and deep openings form, discharging a thin, ichorus, and more or less offensive material. These openings gradually coalesce, until a large ulcer forms, with high edges, irregular outline, hard and indurated areola, and exceedingly painful, particularly at night, or after contact. Glandular infiltration now goes on rapidly, and cachexia is soon established. Occasionally individual glands soften and ulcerate, but as a rule few of them undergo this degeneration. There are cases, now and then, all too few in number, in which the tumor atrophies, and disappears, either by slow absorption, or is cast out bodily.

A peculiarity in the growth of malignant tumors, particularly *scirrhus*—is that as the tumor increases in size, the parts in which it is lodged diminish. Thus in mammary carcinoma, the breast is constantly diminishing, as the tumor-elements displace those of the gland; while in innocent growths, the reverse is a rule.

Anatomical Classification.—This is also known as the “histological,” and is an attempt to classify tumors with reference to their structure, or microscopic characters. For practical purposes such a classification is of little worth, as if relied upon exclusively nothing could be definitely told about a tumor until it had been removed from the body. For purposes of diagnosis, without reference to clinical characters, the method is unsatisfactory, as microscopic evidence is very misleading if relied upon exclusively. I much doubt, if a microscopist could infallibly place a tumor section in its proper place, if he had nothing but the single slide to depend upon and no clinical history, or the tumor itself for inspection. For this reason, among others: A tumor, of course, is of different ages in different parts of its mass. The youngest portions are on the surface; the older at the center. Now the younger parts of all sarcomata are round-celled; the older

parts are possibly spindle-celled. A section taken from one part would not give accurate information, as a round-celled sarcoma must be such throughout its whole mass. Again, the younger parts of a fibroma, would resemble very closely the spindle-celled sarcoma. The method, however, has a certain value, at least for scientific purposes, albeit it lacks much in the interest of therapeutics.

Tissue that is completed is no longer cellular, in the sense that embryonic tissue is. It is true, by proper treatment the cellular characters can be demonstrated, but the fact remains that finished tissue is no longer cellular. Tumor tissue, in most of the forms, is distinctly cellular; there is an attempt to make a tissue, where tissue is not needed, but it is abortive and remains more or less short of the type. The anatomical method attempts to classify tumors with reference to their resemblance to normal structures, using the terms *typical* and *atypical*, to indicate their nearness to or remoteness from the normal type. The nearer the structure approaches the normal type, the greater the innocency. This is an unsatisfactory classification, however; it is too narrow. A more satisfactory one would seem to be something as follows, making three classes, corresponding to the clinical method.

Homologous Tumors correspond to the benign group; they are typical also, as to the tissue with which they are in relation. The class includes such growths as the fibroma, lipoma, papilloma, condyloma, steatoma, chondroma, osteoma, myxoma, neuroma, angioma, and the like.

Heterologous Tumors correspond to the semi-malignant (sarcomatous) group, and are atypical as to the surrounding tissue, but may be typical as to tissues normal elsewhere in the body. In structure, however, they are embryonic, of low organization. The sarcomata (round-celled, giant-celled, and spindle-celled), epithelioma, and the chondroid and osteoid tumors with sarcomatous characters, belong in this group.

Teratoma.—These tumors correspond to the malignant group, and are atypical as to the organism, not resembling any tissue normal to the body. They are represented by scirrhus, colloid, encephaloid, and melanotic growths and deposits.

The necessary limitations of a work of this character forbid any attempt to describe the numerous varieties of tumor-formations under their various heads. For this purpose special works must be consulted. The ability to place any given tumor in the proper class, is all that can be asked of the clinician and therapist, the exact variety in the species being matter of comparatively little moment for practical purposes. It will serve a useful purpose to remember that *typical* is a term used with a double meaning; it may refer to the matrix, and the tumor will be an innocent one; it may resemble normal tissue, but out of its place, and be atypical as to the matrix, and typical to the organism, and yet be semi-malignant *because* of its misplacement.

As already said, for practical purposes it is rarely necessary to do more, in the diagnosis of tumors, than to place the existing one in its proper family relationship. All varieties of tumor of one family, present many, or nearly all, of the characteristic features, one quite like the other. It is true that a fibroma, while benign, often undergoes degeneration, commonly becoming cystic; also that there is a difference in the malignancy of the sarcoma; and some difference in the rapidity of growth and development in the varieties of the malignant group. At the same time, as to danger to life, and liability to recurrence, the essential characters are the same. The table, on the following page, therefore, may be useful in fixing the malignancy in any given case.

Prognosis:—As to tumors in general, prognosis is good, as to recurrence, when they are removed while in the innocent stage, provided no portions are left behind. As to malignant tumors, however, the prognosis must always be guarded, even if the stage is apparently innocent, as it is often impossible to determine whether dispersion has occurred or not, until some time has elapsed. The smallest portion remaining, even if microscopic in size, will probably prove the center for new development, and the new growth is very often more vigorous and rapid than the old one, on account, I have thought, of the irritation of the operation. After dispersion, a cure is not to be expected, and I have ceased to attempt anything operative.

CLINICAL CHARACTERS.

BENIGN.	SARCOMA.	CARCINOMA.
Adult life.	Young life.	Advanced life.
Encysted, or pedunculated.	Diffused.	Diffused.
Grow slowly; steadily.	Grow rapidly, intermittent.	Grow slowly; intermittent.
Often multiple.	Often multiple.	Often single.
Painless, except "pressure effects"	Painful.	Painful, particularly when handled
Attain any size.	After certain stages, degenerate.	Tend to ulceration.
Adhesions rare.	Adhesions the rule.	Always dense adhesions.
Separation of near parts.	Infiltration of near parts.	Infiltration of near parts.
No dispersion.	Often dispersion.	Always dispersion.
No secondary formations.	Often secondary tumors.	Secondary tumors the rule.
No cachexia.	Cachexia common.	Cachexia is characteristic.
No recurrence.	Recurrence, locally.	Recurrence near and remote.
Skin may be thinned.	Skin degenerated, livid, or discolored; large veins.	Skin adherent, and colored.

Therapeutics:—For many years I was an ardent advocate for the use of remedies, in all cases of tumor, and had succeeded in curing, or greatly improving a considerable number. A larger experience, however, has very greatly changed my views. I now advise, most strenuously, the removal of all tumors, no matter what their type, when they are in a local stage, confining the use of remedies to those that are inoperable. Many will criticise such a teaching, no doubt, and possibly accuse me of want of loyalty to my therapeutic creed. But the fact remains, that an adherent tumor, where dispersion has commenced is inoperable, as a rule, and the failure of remedies is only assured when such a stage has been reached. We have lost the favorable opportunity, and it can never be regained. It is a pure sentimentalism to talk about the mutilation of the body, as a tumor is not a normal part of the body; it is an excrescence, and no matter how innocent it may be when seen, no man can tell what its characters may be in a week or a month. I would not dare advise any one, with a tumor that could be safely removed, to delay a day; I should feel guilty of a crime to counsel delay. Even in the case of an organ that has become invaded by tumor elements, the organ is already lost to the economy, and to allow it to remain is to invite a danger that we are powerless to combat. In a few words, therefore, while admitting all that the most enthusiastic therapist can claim, and admitting freely that remedies have cured many tumors, I must also admit that they have as often, yes, *oftener*, failed, and when the fact of failure is evident, there is nothing to be done, in the case of malignant tumors, but render the pathway to the grave as easy and painless as possible. Our treatment by remedies must be reserved for the inoperable cases, and of them there is no lack.

There are operations, however, less radical than excision, that may be forced upon us in these cases of inoperable tumors. Some of them are as follows:

Ligature of feeding vessels, as the uterine artery in uterine fibroma.

Oöphorectomy, to hasten the menopause, or bring it on prematurely, in the same class of tumors.

Castration. in prostatic tumors or hypertrophy of that gland.

Other measures that commend themselves, are injection (subcutaneous) of Methylene blue, in a one per cent. solution, in the periphery of the tumor. MOSETIC MOORHOFF has had a somewhat extensive experience with this agent, and it would appear that many cases of malignant tumor, chiefly sarcoma, had been cured thereby. The injections are made every other day, and the results, while still not constant, have been so good that there is a hope that a remedy has been found for some species of sarcoma.

Dr. W. B. COLEY (*New York Med. Record*, January 24th, 1893), gives a record of ten cases of malignant tumor improved or cured by the occurrence of erysipelas. Two cases have occurred, in my practice, where erysipelas appeared spontaneously, and for a long time the tumor remained stationary in one case, and was diminished in size in the other. In both, however, the disease ultimately advanced to the customary conclusion. Experiments have been made of injections with pure cultures, as well as the *bacillus prodigiosus*, but the results were negative. It would seem that the favorable cases were those in which the erysipelas appeared spontaneously, but even here, later reports would indicate, the results were not curative.

Electrolysis has been tried, with varying results, in myomata of the uterus, and fibrous tumors. Many cases have unquestionably been cured, and it would seem that the remedy promises much. In the case of cysts the curative results are marked, particularly in serous cysts. My own experience with this agent is small, and not worthy of record.

Among remedies, my most gratifying results have been with the black *iodide of lime*, 1 dr. dissolved in 8 oz. of water. The action of light being to decompose the drug, it should always be prepared from an unbroken package, and the solution kept in a dark place, or the bottle painted black, or covered with a black cloth. The dose is a dessert-spoonful, four times a day. In fibroma, particularly uterine, I have had

most remarkable results. My experience has been, I think, that it is particularly indicated in the bleeding forms, and before any degeneration has occurred. The remedy has been used in all attenuations, high and low, but the crude black powder, is the only preparation that has been of the slightest service.

Among the more legitimate remedies, *Arsenic* must take first rank, in all forms of carcinoma, but particularly in the open stage of scirrhus, and encephaloma. I have had satisfactory results, if not in a cure at least improvement, in almost all attenuations up to the 30. Perhaps the best have been in the use of it as suggested by Prof. MITCHELL, the 2^x externally, and the 6^x internally. In the majority of cases, after a few days the applications seems to cause much pain, and I have always stopped its use for a few days at such times.

Baryta carb., *Secale*, *Phytol dec.*, *Thuja* and *Sulphur* have been credited with cures of tumors of various kinds, but the clinical records are meagre, and my experience has not been very satisfactory. *Hydrastis* long enjoyed what I am forced to believe a fictitious reputation; particularly in the cure of carcinoma; I have never had the faintest indication of benefit from its use.

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